*Problem of Coal Supply and Power Rates—Modernizing the St. Louis Generating Station—Other Feature Articles and Regular Departments*

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# Electrical World

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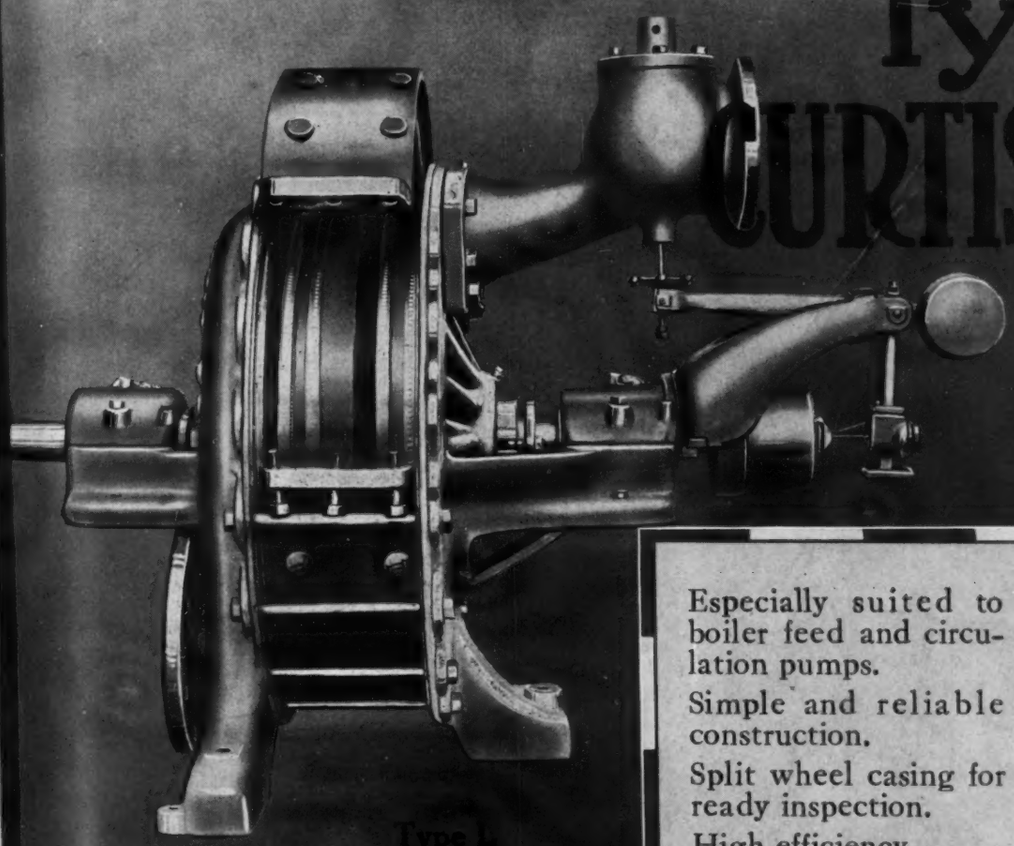

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## Power Transmission for Small Plants

THE special problems of the plant supplying a small community often lead to interesting results, and an excellent example of this is shown in R. E. Carlson's description in the current issue of the way in which a little Illinois town of 2000 inhabitants was furnished twenty-four-hour service on an economical basis by the purchase of transmitted power from a central station about 12 miles (19.2 km.) away. The situation is one not uncommon in small places, and it has been the cause of many a successful extension of the transmission networks which have done such sterling service throughout the country. The economic side of the matter is clear enough; except under unusually favorable circumstances the small generating plant cannot furnish twenty-four-hour power without extensive generating costs. A fairly large plant with enough day load to warrant running can take over the additional service without any particular difficulty and in most instances can furnish twenty-four-hour power at a price lower than that at which it can be locally generated.

In the case here considered the source of energy was a two-phase plant and the initial step was to install a two-phase-three-phase raising transformer equipment to put 13,200-volt energy on the line. The most interesting feature of the line itself is that despite the small amount of power transmitted, the total capacity being only 600 kva., it was found wise to use steel poles for the main line. For this purpose slender latticed steel poles 45 ft. (13.7 m.) long, spaced 300 ft. (91.4 m.) apart, were employed, set in concrete foundations and carrying three No. 4 stranded conductors with a stranded steel cable for a ground wire above. Despite the fact that most of the work was carried on in midwinter under unfavorable conditions, the cost of construction ran little over $1,800 a mile ($1,080 a kilometer), a figure almost the same as the cost of a thoroughly well-built wooden pole line, with the advantage of a considerably longer probable life. To keep the construction figure down, the work had to be carried out in an orderly and systematic manner with various little precautions in the way of assembling poles and stringing wire which Mr. Carlson fully describes. The result has been highly satisfactory, and the example is one which may be followed to advantage in many small plants. The particularly interesting thing about it is the economical use of steel, not in the form of steel towers, but of light latticed poles. Steel of course is now high in price, but so are wooden poles, and every projected transmission line has to be figured very carefully to be sure of striking the correct economic balance between these two structural materials. The results can often be determined by the relative cost of transportation for the two reckoned from their necessary shipping points.

## Mounting Costs and Higher Rates

AMONG certain operating officials there is a strong feeling that the movement to increase electric rates should have been started last winter when coal went up so sharply. This criticism has a direct bearing upon the attitude of companies which still hesitate to advance schedules. It is also of interest to the regulating commissions. Moreover, it opens the whole question of traditional central-station policy, which for years has been to build up volume of production and thereby to reduce unit operating costs and permit steady decreases in rates. To check the regular growth of this policy, to substitute advancing rates for the declining rates of the old order, is a change of front which is not made easily.

Familiarity may breed contempt even for economic laws. When there was apparently a safe margin of income over outgo it was a simple arithmetical calculation to figure that if the number of kilowatt-hours sold was only increased and there was even a slender margin of return the earnings were bettered. We continued the race for volume of production and sales, and the possibility of a change in the bases of cost remained in the disregarded background, did not enter at all into the equation. Totals were mounting, the load curve was rising, greater and more economical generating units were ordered. The industrial power load and the power factor improved, the local railway load gravitated to the central station because of the generating economies which concentration assured. Moving along these lines steadily, the entire electrical industry looked forward happily to the day of greater concentration of generating units, of networks of transmission lines carrying energy at lowest cost to every user.

War changes the face of all things, perhaps not for all time, certainly for the period when its rough play is the main economic force. At present the tendency toward declining rates has been arrested sharply. Whatever isolated exceptions there may be to this rule, the facts of inflated cost are incontrovertible. The first answer which the central station made last winter was to struggle as best it might against the current. There were clear reasons why it did not resort to immediate higher rates to avoid depletion of the corporate pocketbook.

Foremost among these was the traditional policy which we have been discussing. Second was the thought that coal prices could not misbehave except tem-

porarily, that they were out of joint for only a brief while, that coal was too plentiful to be in absurd demand at fancy figures, that the railroads would get control of the situation, etc. Third was the lamentable fact that utility rates, unlike the prices of the greengrocer, are not subject to day-by-day fluctuation according to the measure of supply at the source and the quantity of demand from the consumer; some stability has been regarded as necessary.

The distant vision still shows outlines, though a trifle more hazy, of ever-increasing size of generating units, ever-decreasing generating costs, of transmission steadily extended to wider areas with increasing benefits to the consuming public and industries in low rates; it is a vision to which the electrical industry will cling as the ideal of attainment which it will reach if and when possible. But in the meanwhile there is a sterner reality to confront. Some companies will not be brought face to face with the necessity of advancing rates to prevent red-ink balances; by fortunate circumstance, by unusual foresight, by the trick of fate, they will avoid it. But for the great bulk of companies higher cost is the inescapable factor in their accounts of which they will have to take cognizance to avoid regret.

## Telephonometry

IN THE testing of telephone circuits it has long been the practice to ascertain by successive trials the number of miles of standard artificial telephone cable which give the same volume of telephonic sound as the particular circuit under test, using standard transmitting and receiving apparatus over both circuits alternately. Again, when telephone transmitters are tested, it is customary to take a definite length of standard cable circuit and talk over it with a standard transmitter and with the tested transmitter alternately. The difference in volume, if any, can then be expressed in terms of the difference in length of the standard cable circuit found necessary to restore auditory compensation. A similar test can be made in the case of telephone receivers.

The above auditory-comparison tests, while definite and reliable, are recognized as being very crude and tedious. An ideal method should permit of an exact quantitative determination being made, conveniently and swiftly, of the impedance of a telephone circuit in the one case, or of the strength of a transmitter, or of the sensitiveness of a receiver.

If any single frequency existed in telephony which was an exclusively critical frequency, tests of and for transmitters, circuits and receivers at that critical frequency could be made without much difficulty. The fact is, however, that while there are prominent telephonic frequencies, there is no single criterion of frequency. Speech contains any and all frequencies between, say, 100 and 2000 cycles per second, if not in one and the same voice, at least in the voices of a group of persons. This vague extension of telephonic action over so wide a range of frequency renders the question complex and indefinite.

A recent contribution to the subject has been made by B. S. Cohen in a paper before the Institution of Post Office Electrical Engineers in London. First, the carbon transmitter is replaced for testing purposes by an electromagnetic transmitter; secondly, an experimental artificial voice is described, and, thirdly, an experimental artificial quantitative ear.

The artificial voice consists of a revolving make-and-break interrupter, driven periodically over such a range of speeds as will cause the impressed frequency to vary to and fro over the range 700 cycles to 1300 cycles in less than one second. This is certainly impartial behavior in regard to frequency, since this range becomes completely covered. A specially constructed telephone receiver in the circuit of this interrupter emits acoustic oscillations, in a definite wail, during each such rhythmic discharge, there being no resonant rise in amplitude of vibration throughout. It is intimated that this constant-amplitude frequency-ranging wail is at least just as good for testing purposes as the well-worn count "one, two, three, four, five," or the familiar assertion "Mary had a little lamb," both of which incantations are in vogue among testing telephonists. The standard wail is then delivered to the transmitter at the sending end of the artificial cable circuit. At the receiving end is installed a step-up transformer, an audion or tandem-audion amplifier, a carborundum-steel rectifier, and a sensitive galvanometer of the D'Arsonval type. The latter gives a scale deflection in response to the wail at the sending end, and, by proper calibration, this deflection can be evaluated in microamperes.

The complete set, or telephonometer, has the great advantage of being definite, swift and reproducible in its action, so that either a transmitter or a telephone circuit can be tested quantitatively in a very short time by a single observer. The apparatus constitutes a distinct advance in the acoustic testing of telephone circuits, but it is probably capable of being simplified without sacrifice in effectiveness.

## Revamping the Central Station

THE change in generating practice brought about by the introduction of the steam turbine some fifteen years ago has been very startling in its results, and particularly so in the case of big city plants in which economy of space may become nearly or quite as important as economy of coal. A very excellent example of what has happened will be found in John Hunter's description of the remodeling of the St. Louis generating station, which in its first stage of existence fourteen years ago happened to be one of the last big plants with reciprocating engines. One need not lament this unhappy condition, because for several years it was a grave question whether it were better to be on the last lap of the engine's career or the first lap of the turbine's. The former had to face that extremely disagreeable thing known to accountants as depreciation due to changes in the art; the latter ran up against depreciation of quite another, but no more desirable, kind.

All that has passed into history now, and the impor-

tant matter for consideration is the way in which a single station obtained more than eightfold capacity by change of equipment. The great cross-compound reciprocating engines of the original plant had scarcely more than settled down to their bearings before it was necessary to increase the station capacity, and four 5000-kw. turbine-generators were added. The original boiler plant consisted of twenty-eight Scotch boilers. To take care of the new units forty water-tube boilers were added on an upper deck. Note the outrageous number of boiler units then needed for a mere 20,000-kw. generating capacity. Three years later more output was required, and the four turbines were replaced, after only three years' service, by 12,000-kw. turbines. Again more steam was needed, and twelve of the Scotch boilers were replaced by water-tube boilers. So far as the turbine plant was concerned, it now had fifty-two boiler units to provide steam for 48,000 kw. as against forty boilers for the 20,000 kw. The generating equipment remained in this stage of evolution for seven years, and then there was another forward movement. This time one of the original 3000-kw. reciprocating-engine sets was removed, and in its space was installed a 20,000-kw. horizontal turbine. For this unit the remaining sixteen Scotch boilers came out and ten water-tube boilers went in, with 2000 kw. capacity per boiler. With the greatly increased output two of the reciprocating sets were removed and their room was utilized for the extension of the switchboard space. Finally, plans are now under way for abolishing the remaining two old units and putting two 20,000-kw. turbines in their place. One rarely sees a more striking example of the very radical changes in practice wrought by a few years' development. It would not be unsafe to prophesy that when the two new units go into place they will not require ten boilers apiece.

## The Conservation of Transportation

A VERY important edict under the "defence of the realm" regulations has been put forth in England by the Controller of Coal Mines. At one stroke the reorganization of transportation has been put under way, and work has been done in a few weeks which probably would require in this country not less than six months of jaw-play by the irreconcilables in Congress and 10,000 columns of open letters in the newspapers. The sum and substance of the English regulations is this, that the transportation of fuel is to be reduced to a minimum by the very simple process of limiting the territory within which one source of supply can distribute its coal. In other words, instead of following our wasteful American method of transporting nearly everything over the maximum distance, the regulations see to it that at least one necessary article shall be systematically shipped over the minimum distances practicable. Moreover, the uses for which fuel is designed are divided into three classes, steam and manufacturing, gas and coking, and the house supply; and coal from a given source has its own territory of distribution which may or may not be quite the same for each of these three uses. The effect is obviously to keep down unnecessarily long shipments and to put the necessary fuel into each district with as little use of rolling stock as is possible.

To carry out such a project successfully implies exactly what exists in England, an iron hand on the whole mechanism of the production and distribution of this particular necessity. How far a similar scheme could be carried out in this country, even if the authority could be obtained in the course of time, is not altogether clear; yet it is certain that very much could be done in the way of easing the severe burden of transportation. The fuel regions of this country are not distributed nearly so favorably as in England, and the normal distances of carriage have to be much greater. Yet a very considerable measure of relief would be obtainable by an organization of the distribution so that the average distance traveled by a ton of coal would be considerably reduced. Such regulation would undoubtedly work inconvenience in some places where industries have been wont to secure desirable coal from certain localities even with a very long haul against it. It would make it necessary for consumers in general to use such coal as they were able to get, but in not a few instances the reduction of transportation would mean actual economy. The broad principle is one which in these grave times should be followed as far as is possible with respect to all commodities over which the government has direct or indirect control, otherwise we shall suffer severely from that gross waste of transportation facilities which has been characteristic of our industrial development. Whether the British fuel plan should be tried here or not in anything like its original form, there is no doubt that the principle is sound and deserves to be forwarded. Any saving, however slight, if applied nationally means much to our already overburdened railroads.

### The Coming Issues

PRESENT prices of material and labor make it so essential to consider every means of increasing plant economy and securing the maximum benefit out of the invested money that the advantages of the uniflow engines should not be overlooked. In the Aug. 11 issue of the ELECTRICAL WORLD there will be presented an article on the performance of a uniflow engine in a steel mill. This issue will also contain the first installment of an article on transmission-line charging currents, taking up a method of using capacity and potential coefficients to determine charging currents in three-phase lines. Prof. C. E. Clewell's article in the same issue will discuss the operation and upkeep of factory lighting systems. There will also be another article dealing with the coal situation in Central Western States. The articles on this subject which have been appearing in the ELECTRICAL WORLD are the report of an investigation by an editorial representative, designed to impress upon readers the importance of forehanded preparation.

ELECTRIC UTILITIES ASK PROMPT MOVEMENT OF CARS

# Looking Ahead on the Coal Supply

## Companies in Central Western States, Driven by Experiences with Scant Supply and High Prices, Trying to Meet Their Problems—Policy of Buying Coal Mines to Safeguard the Future

FOR their coal supply most central stations operating steam plants are dependent upon mine operators with whom they have contracts, upon open market coal and upon the railroads which move the coal from mining to consuming centers. At this time few properties own their own mines, but for their future protection central station interests will give more attention to safeguarding their fuel supply; in many cases mines will be bought and operated.

At present and during the winter of 1917-18 the problem of the companies is not so much what their future policy shall be, it is the very concrete one of how they are to get their coal supply at reasonable prices. Subject to such moral or legal suasion as governmental authorities may exercise upon the coal producers and distributers and railroads, the central stations are virtually in the hands of those agencies.

### OUTLOOK IN CENTRAL WEST

There is a disposition in the Central West to feel that the seriousness of the coal situation is not appreciated in the East and in the national Capitol. Particularly is this the case where companies were perilously close to the suspension of service because of coal shortage last winter. In these instances the tendency is natural to feel that great efforts will be required to prevent a repetition of these conditions in the coming season.

It is difficult to allocate responsibility in every instance for non-delivery of contract coal between mine operator and railroad. The coal producer on many occasions has undoubtedly been tempted to neglect deliveries under low-price contracts because of the orders that he received where price was little if any consideration to the buyer. Whether or not a failure to make deliveries under contracts subjects the operator to possible liability for damage is one of the points which is under consideration.

No one questions that coal production is greatly stimulated by present prices. It is held back, however, by the shortages of labor and materials which affect other industries. Coal operators assign as one reason for their failure to hold men the fact that the irregularity in car supply makes it impossible to assure continuous employment. Men will not stay unless employment is continuous because they can get jobs elsewhere in places where this objection does not arise. So far as central stations are concerned the point is not so much that this problem arises as that the lack of solution of it is one of the perils affecting the question of coal supply next winter.

### PLANNING TO OVERCOME RAILROAD CONGESTION

Close as some of the great Western utilities are to the coal fields, they were absolutely bound time and again last winter by the fact that railroad congestion could not be overcome. The great advance in market price of coal can be relied on to stimulate producers to increase production, but the weak link in the chain from pit mouth to stoker is the railroad.

In the effort to prevent breakdown of the railroad numerous local movements have been set afoot, supplementing and co-ordinating the policies of the authorities and railroad and utility leaders at Washington. As large users of coal, vitally dependent upon regularity of supply, furnishing light, heat and power to the community, the electrical utilities have every interest to serve in stimulating local plans to facilitate coal car movement.

### RESPONSIBILITY IS INDIVIDUAL

Utilities of the Central West appreciate that strong representations have been made on their behalf for preferential treatment in coal car movement. They realize that their recognized standing as quasi-public institutions, as purveyors of service to plants engaged in government military and naval operations, gives them a right to ask preferential treatment in the distribution of coal.

They also understand, however, that the obstacles which will hamper railroad operation are more fettering than any hitherto experienced. It is for this reason that executives of utilities in Central Western States feel that the first responsibility in the question of coal supply rests directly upon them. If they cannot get relief for themselves, Washington may do it for them;

SIDE GUIDE & GRIPPER

but their standing will be improved if they go to Washington showing that they have first employed every means in their power to solve their own problems. Washington will have other things to do than to protect a company which does not make the effort to protect itself.

### MORE MOVEMENT, NOT MORE CARS

Among the definite suggestions made to a representative of the ELECTRICAL WORLD on the railroad part of the coal problem, as published in last week's issue, is that of Alex Dow, president and general manager Detroit Edison Company. Mr. Dow points out that it is not more cars but more prompt movement of the existing car supply that is needed. To further this desirable end there is no question that the railroads, through their organization in Washington, subsidiary to the Council of National Defense, are co-operating more effectively than ever before.

As Mr. Dow also pointed out, to quicken the move-

PURCHASE OF COAL MINES IS ONE SOLUTION

ment of cars it is necessary that there be more locomotives, more trackage, more men for locomotives and switches. The new plan of co-ordinating facilities of railroads where there is competitive trackage between terminals will be a factor in preventing congestion in car movement, if it can be kept effective through the fall crop traffic period and the snows of winter months.

Electrical utilities understand thoroughly the difficulties under which railroads are laboring in their effort to meet increased costs without adequately increased rates. They appreciate that the public and the authorities, while asking greater traffic movement from the railroads than ever before, are hampering them seriously by the refusal to allow the higher rates which would make it easier to raise fresh capital for improvements. While not withholding full credit to the railroads for the improvement which they have made recently in operating results, the electrical utilities feel that they have the right to ask that there be no relaxation but that there be renewed determination to solve the problem of coal supply during the approaching winter.

Another factor which is not overlooked by the utilities of the Central West in their apprehensive calculations for the ensuing months is that upon the exceedingly active industrial demand of last winter there will be superimposed in the coming winter the enormous requirements of military and naval forces enlarged to war standard. These will be a further tax upon the already overwhelming demands for railroad transportation.

### STATE AUTHORITIES WILL ACT

In the States of Indiana, Ohio and Illinois the coal situation is to so large an extent an intrastate one that utilities are justified in looking to their state authorities for rigorous action toward relief. Observation shows clearly that state officials in at least one of these states are aroused in the largest sense to the economic possibilities of abnormal coal conditions during the coming winter. In each of these states the authorities can be relied on to use broad powers, granted and implied by the statutes, to keep the coal situation within bounds; and action of an extremely drastic character is possible if reasonable methods and arguments are ignored.

It is difficult to say much that is specific about prices of coal as they are reported in Central Western States because conditions differ so greatly in various localities. Companies report experiences with prices which are entirely in disagreement with the general understanding held in the East. In some instances companies report that the efforts made to produce lower prices have had merely the effect of causing advances. Standardization of price has not been effected and a number of companies despair of keeping their per ton costs down.

Closely connected with the question of difficulty in getting adequate supply is that of the rates which should be charged to offset the larger costs involved in higher price and larger investment in reserve stocks in order to safeguard against shortage. Except in Indiana, the question in the states mentioned, as well as in Michigan, is receiving consideration by companies acting individually. In Indiana the companies have united. Their first action through the Indiana Electric Light Association has been changed to comply with the ruling of the Public Utilities Commission that individual action by companies was preferable to association action. Generally, however, costs are being affected so heavily by coal conditions that corresponding changes in rates are regarded as essential to the proper protection of the properties.

The unexpected experiences of last winter and the continued troubles this year, together with the uncertain outlook for next winter, combine to impress upon companies the wisdom of new steps to strengthen their position as to coal supply. These steps will be the purchase of coal mines or of interests therein, not only in properties now in operation and yielding fuel for immediate requirements but also in lands capable of development in the future.

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## Easily Regulated Lamp Dimmer

By means of a socket formed of high-resistance material or introducing a helix of high-resistance wire between the base and the lamp a practically unlimited degree of illumination is obtained as outlined in patent No. 1,228,835 by screwing in the lamp in different ways. The invention is that of Harry Alexander of New York. Any suitable material—for example, tin or German silver—may be used for the high-resistance material, while copper may be used for the low-resistance material when employed.

SIDE GUIDE & GRIPPER

# Giving Twenty-four-Hour Service in Town of 2000

## Local Generating Plant Supplanted by a Transmission Line Service—Engineering Features—Method of Erecting and Cost of Construction

BY R. E. CARLSON

UNTIL recently Mount Carroll, Ill., a town of 2000 inhabitants, was supplied with energy from a local generating plant. Although twenty-four-hour service was desired, it was not practicable to provide it owing to load conditions. To meet this need a 13,200-volt, three-phase transmission line has been constructed connecting it with the People's Gas & Electric Company's central station at Savanna, Ill. Some of the construction features of this line and the method of erecting will be described in what follows.

Part of the way between Savanna and Mount Carroll (12 miles, or 19.3 km.) the line runs along private right-of-way, and the rest of the route is along public highways. Wooden poles are used inside city limits and steel poles elsewhere. Outdoor substations are installed at each end of the line, and midway between them is a sectionalizing tower.

To convert the two-phase energy which is generated at Savanna into suitable form for economical transmission, T-connected transformers are installed at the generating end of the line. Three 1100-2200/13,200-volt units rated at 200 kva. each and having 5 and 10 per cent taps are employed, one being provided for reserve. From the switchboard to the transformers the low-tension circuits consist of lead-covered cable laid in underground fiber conduit with the exception of that portion extending above the substation foundation, where galvanized-metal conduit is employed.

Air-break switches are mounted on top of the substations, which are of the steel-tower type, the three phases being operated simultaneously by means of a lever at the bottom of the tower. Electrolytic lightning arresters are employed at the substations.

At the Mount Carroll end of the line are three 37.5-kva. single-phase delta-connected transformers, which keep the pressure down to 2200 volts, at which energy is distributed throughout the circuit. On the 2200 transformers there have been connected a polyphase watt-hour meter, employed in the primary circuit, and a three-coil air-break switch on the 2200-volt side. Air-break switches similar to those installed at the Savanna substation are employed so that transformers may be disconnected for repairs or for changing connection without interrupting service on the high-tension line. Electrolytic lightning arresters cannot be used at this end of the line, as it was impossible to make the necessary arrangements to insure their being charged every day; consequently multigap-type arresters are used. If the arresters mentioned, used with the ground wire stretched along the top of the pole line, are not sufficient to protect against damage from lightning, others of multigap type will be installed along the lines at points to be determined by actual operating conditions. Both substations were furnished by the General Electric Company.

The sectionalizing tower was built by providing special steel work on one of the ordinary steel poles used on the line and by mounting three Delta-Star type TM disconnecting units. A view of this tower is given herewith.

Although the line will be operated at 13,200 volts for the present, it is constructed to operate 3000-volt service, and this voltage will be adopted as soon as conditions warrant. From the generating station to the city limits, 45-ft. (13.7-m.) Western red-cedar poles with 8-in. (20-cm.) tops are installed about 150 ft. (45.7 m.) apart, except on curves, where shorter spacing is used. Corners are turned by means of two poles, no buck-arm constructions being employed. The wooden poles are equipped with Hubbard bow-arrow steel cross-arms,

FIG. 1—TYPE OF EXPANDED STEEL-TRUSS POLES USED

ground-wire bayonets and double-arming sets, Keystone trusses, Belcher ground-wire clamps and Locke insulators.

The conductors, which consist of three No. 4 B. & S. gage hard-drawn stranded cable, are placed symmetrically 36 in. (91.4 cm.) apart, with a 5/16-in. (7.9-mm.) Siemens-Martin stranded steel cable above on bayonets. The ground wire is connected with the earth as a fifth pole. In calculating the size of poles which would be required, it was assumed that the maximum stress will be equivalent to a loading of 0.5 in. (12.7 cm.) of ice and 8 lb. wind pressure (3.6 kg.—390 kg. per square meter) upon the conductors, which have a sag of 3.5 ft. (1.06 m.) on 150-ft. (45.7-m.) spans.

In the country Bates expanded steel-truss poles 45 ft. (13.7 m.) in length are installed, steel cross-arms on bayonets being employed. They were set in 1-2½-5 concrete and were placed 300 ft. (91.4 m.) apart except on curves. Storm guys were attached to the poles every half mile (0.8 km.), one pole equipped in this manner being shown in one of the accompanying illustrations.

SIDE GUIDE ★ OPTIPEN

Long corners and long spans were extra heavily guyed. Conductors were pulled to have a sag of 8 ft. (2.4 m.) in 300-ft. (91.4-m.) spans. Conductors were placed 48 in. (1.2 m.) apart and transposed at three points along the line in order to minimize static disturbances. No. 6 B. & S. gage dead-soft bare copper wire was employed after tying the wires to the insulators. Four

FIG. 2—TYPES OF COUNTRY AND CITY POLE CONSTRUCTION

storm guys were employed in some places and two in others, the wires being anchored with Everstick anchors, using ⅜-in. (9.5-mm.) iron cable for the guy wires.

Poles were transported without the cross-arms and fixtures attached, and the cross-arms were sent in bundles, one bundle for each pole. Poles were distributed among the cars in which they were transported so that a large portion could be unloaded at the middle of the transmission line, with smaller portions near the two ends. By doing this the average haul per pole after leaving the freight cars was reduced to about 3 miles (4.8 km.). In distributing the poles along the private right-of-way it was found that the best results could be obtained by carrying three poles per wagon with the average team and wagon available and under ordinary soil conditions.

Before erecting the poles the cross-arms were attached by means of clamps, thus eliminating the necessity of drilling any holes. Where double cross-arms were required they were placed on opposite sides of the poles and clamped together by means of through-bolts. Across the top 10-ft. (3-m.) sections of the poles were fastened to the main parts before the cross-arms were attached, this being done by riveting the web connectors to each side of the pole top with twenty rivets. The joints may readily be seen in the accompanying illustration. The ground-wire supports, or the bayonets, run up to the top of the pole by means of 0.5-in. (1.27-cm.) bolts. The holes which are required for these bolts were the only ones which had to be drilled on the entire pole, but this was not an impediment to construction, as the holes were drilled before the poles were distributed along the line.

The steel poles were set with a tackle consisting of a pole rope, a jack to elevate the pole rope at the beginning of hoisting operation, double blocks attached to the ends of the pole rope, and hand lines to guide the pole while it was being raised. This rigging was found to be more satisfactory in raising by means of a gin pole or gin wagon. The pole rope was attached near the top of the pole and passed over the jack, which was placed near the middle of the pole, this jack being high enough to cause an upward pull on the pole when the pole rope was hauled in by a team of horses. One end of the double block was fastened to the pole rope, the other being suitably anchored, and the team was driven in the direction in which the pole was elevated. Under good conditions it was found that poles could be raised in from fifteen to twenty minutes.

After the poles were erected they were held in position with four temporary guys of No. 12 iron wire, the pole meantime resting on the ground. The work of setting poles was completed by the concreting gang, which followed the pole-raising gang. Supplies for making the concrete bases were distributed in advance of this gang in order that operations might be carried on with the least delay. Just enough sand and gravel were left at each pole to make the particular foundation. A motor truck was used to distribute most of the gravel, and teams were used for the construction wagons, which carried the concrete-mixing box and water tanks. This was done because otherwise the horses would have had to stand idle for a considerable portion of the time. In making the concrete bases a form about 4 ft. (1.2 m.) high was used, first being placed in the bottom of the 6½-ft. to 7-ft. (1.97-m. to 2.1-m.) holes which were excavated for the poles. After the concrete was poured in to the top of the form earth was packed around it and the form pulled up so that the remainder of the base could be completed. Hooks were attached to the forms in raising them. It was impossible to use a single form which would extend the

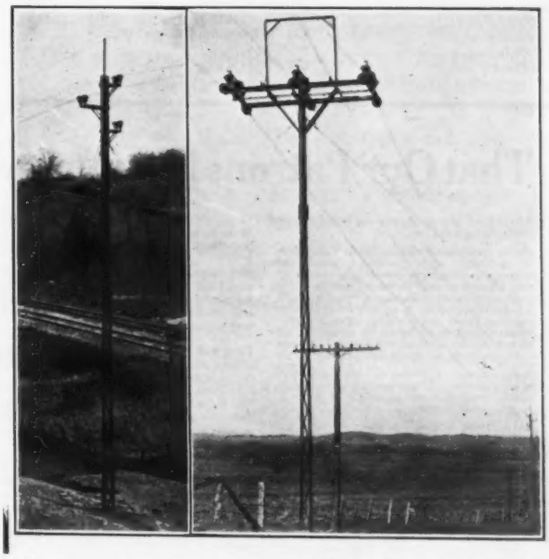


FIG. 3—POLE EQUIPPED WITH STORM GUYS; SECTIONALIZING TOWER

entire depth of the pole, since it would have been very difficult to raise the form out of a 6-ft. (1.8-m.) hole on account of the frictional resistance. The tops of the concrete bases were tapered to provide a watershed. Approximately 1 yd. (0.76 cu. m.) of concrete was used at each pole. At the turns in the line, however, a heavier setting was used, 1.5 yd. (1.44 cu. m.) being

utilized. The temporary guys previously mentioned were fastened in the ground by sticks 4 ft. or 5 ft. (1.2 m. or 1.5 m.) long, which were left in place for about a week after the pole was placed in order to give the concrete an opportunity to set.

To facilitate climbing the steel poles when installing the insulators and attaching the conductors thereto the construction men were provided with the special climbers described on page 97 of the Jan. 8, 1916, issue of the ELECTRICAL WORLD. Operations were carried on in such a manner that the linemen had to climb each pole only once. First of all, the transmission-line conductors were strung along the ground beside each pole. After the lineman had climbed the pole he installed a pulley on the cross-arm and hauled up the insulators and line conductors, which were attached to the pulley tackle by a ground man. The conductors were not attached to the insulators as soon as they were raised into position, but were allowed to rest on the cross-arm until they could be pulled to the proper tension. After this had been done and the sags had been allowed to equalize themselves for several days, a lineman placed the lines on the insulators and fastened them thereto. The ground wires were installed last of all.

The type of construction employed was selected because the cost was practically the same as that for equally well-built wooden pole lines, and it was felt that the fixed charges would be lower and longer life would be obtained by the use of steel poles. Poles were set in concreted joints in favorable weather, but the remainder of the wire work was carried on during the middle of the winter and under very cold and unfavorable conditions. The cost data follow:

| | | | |
|---|---|---|---|
| Pole structures complete | $476.00 | Framing | $7.50 |
| No. 4 copper | 756.00 | Setting | 27.00 |
| 5/16-in. ground wire | 105.00 | Concreting | 81.00 |
| Insulators | 56.00 | Stringing | 48.00 |
| Hardware | 30.00 | Guying | 30.00 |
| Line switches | 17.00 | Tools | 40.00 |
| Survey | 14.00 | Miscellaneous material | 21.00 |
| Clearing | 15.00 | General expense | 95.00 |
| Hauling | 14.50 | | |
| Digging | 24.00 | Total | $1,857.00 |

## TELLING THE PUBLIC ABOUT RATE ADVANCES

### Method Followed by the Penn Central Light & Power Company—Why Increased Costs Mean Increased Rates

In making increases in rates because of higher costs of labor and of coal and other materials central stations have followed various methods of announcing the change in schedules to their customers. Among the companies which followed the plan of giving extensive publicity to the abnormal conditions leading to rate advances is the Penn Central Light & Power Company, Altoona, Pa., of which J. H. Shearer is the general superintendent.

This company entered upon an extensive campaign of publicity to acquaint the public with the facts. In a large advertisement addressed to the public a month before the new schedule became effective it gave the reasons why advance was necessary.

In the initial notice the company expressed its regret at being obliged to announce an increase in rates. The extent of the advance to general public consumers was stated frankly: "To domestic and commercial consumers the additional cost will amount to approximately 12 per cent."

A number of statistics of higher cost were shown, as for instance the following:

| AVERAGE COST OF COAL PER GROSS TON, ALL PLANTS | | Per Cent Increase | AVERAGE PRICE PAID FOR COPPER PER POUND | | Per Cent Increase |
|---|---|---|---|---|---|
| 1914 | $1.90 | .. | 1914 | $0.1499 | .. |
| 1915 | 2.11 | 11 | 1915 | 0.2003 | 33 |
| 1916 | 3.20 | 68 | 1916 | 0.2927 | 95 |
| 1917* | 5.39 | 183 | 1917 | 0.3849 | 156 |

*Three months.

There has also been an increase in the prices paid for insulators, poles, cross-arms, hardware, etc., from 30 per cent to 150 per cent. These figures show an increase of at least $3 per ton in the price now being paid for coal, as compared with 1914, which at the present rate of consumption means an increase in expense of $240,000 per annum.

That Our Patrons May Know
Electricity is an imponderable and invisible agent producing light and heat.
Coal is an important element in the manufacture of electricity, which becomes a transformed energy, transmitted over wires into homes and offices, where it is ready for use without the inconvenience and waste of the original fuel from which it has been converted. It requires no statistics or argument on the part of this company to demonstrate to the satisfaction of its public and its patrons that the increased cost of coal has become a serious item in the manufacture of its product.
Every consumer in greater or lesser degree has been affected by the fundamental and world-wide conditions that have brought the cost of fuel to an unprecedented height.
The following tabulation is interesting in that it gives the comparative cost of coal in 1914 and ensuing years, and it furnishes complete justification for the higher rate of service which this company has been compelled to establish, that IT MAY FAITHFULLY FULFILL ITS FUNCTION AS A PUBLIC UTILITY CORPORATION:
AVERAGE COST OF COAL PER GROSS TON
1914 ..... $1.90
1915 ..... 2.11 ( 11% increase)
1916 ..... 3.20 ( 68% increase)
1917 (three months) 5.39 (183% increase)
Coal is but one important element in the manufacture of electricity that has increased tremendously in cost, but it constitutes a burden upon this company that makes it imperative that income shall be increased.
At present prices and consumption, coal imposes an additional expense cost upon this company of $240,000 per annum.
This company respectfully submits this fact to the candid and fair consideration of its public and patrons, confident that it will secure their cheerful acquiescence in the new policy which imperative business necessity has forced it to adopt.
There is no immediate prospect of relief from any source. On the contrary, the outlook is today less favorable than during the past four years.
This company has been reluctant to increase the cost of its product, but it now has no other alternative. It is unable to escape conditions which fall upon every individual and every corporation.
The MAINTENANCE OF EFFICIENT AND SATISFACTORY SERVICE makes it absolutely essential that this company increase its service rates, and we earnestly solicit an intelligent understanding of our difficulties and our necessity, that the public may know why service rates have been increased.
This company has and will continue to serve its patrons at the lowest possible cost consistent with wise and economical management.
It demands only that it be permitted to continue as a servant of the people.
Penn Central Light & Power Co.
J. H. SHEARER, General Superintendent

That Our Patrons May Know
This company IS or is NOT justified in asking its patrons to pay a higher rate for service which it has rendered and which it will continue to conscientiously render.
If this company PROVES that its present rates will not permit its system to be wisely, efficiently and ECONOMICALLY managed, that it may render THE SERVICE THAT ITS PATRONS EXPECT AND HAVE A RIGHT TO DEMAND, then, it is respectfully submitted, its patrons will cheerfully accept a higher tariff which is dictated by IMPERATIVE BUSINESS NECESSITY.
If this company PROVES that its income is not sufficient to pay the wages of its workers, to purchase coal and other supplies and materials that are essential to successful operation and wise maintenance then, it is respectfully submitted, there cannot be REASONABLE OBJECTION to its aspiration to live.
If this company does not prove that its present income is insufficient to meet the demands of labor and the cost of materials and supplies, then objections to its new rates are warranted and should have due consideration.
The State of Pennsylvania has created a Public Service Commission entrusted with the responsibility of determining the REASONABLENESS of rates exacted for public service, and that commission, unless it is satisfied that rates are REASONABLE, could not be induced to sanction the increase sought.
This company has presented statistics which are ample corroboration of its claim that present revenue is no longer adequate to its LEGITIMATE needs. It has proven that coal, the largest factor in the manufacture of electricity, has attained unprecedented cost, and is imposing an additional burden of a quarter of a million dollars yearly upon it.
It has PROVEN that fundamental and world-wide economic conditions have intervened to disrupt long-existing stability, and that an increase of rates is essential to its maintenance of its function of supplying its public and patrons with an indispensable commodity.
Unless it is not PROVEN that this company has misrepresented its facts or has over-stated its case; if it is not proven that this company can successfully continue at existing rates, then, we represent in all fairness, it is entitled to the cheerful acquiescence and co-operation of its patrons in a policy which was reluctantly adopted, but to longer delay which would have been fraught with the most serious consequences.
This company does not come to its patrons animated by a desire to add to its profits.
It is controlled by but one consideration, and that is to secure sufficient revenue to meet the demands of labor and provide necessary supplies and materials entering into the production of electricity.
Unless it is demonstrated that this company IS NOT ENTITLED TO INCREASED COMPENSATION—unless it is clearly established that changing business conditions have not made it necessary to revise its schedules of rates—then, it is insisted, there cannot be substantial objection to the tariffs which have been filed with the State Public Service Commission.
This company's duty to the public and its patrons, no less than to its stockholders, is to provide sufficient revenue to meet all unavoidable expenditures and provide a reasonable return for money that has been economically invested.
PENN CENTRAL LIGHT AND POWER COMPANY
J. H. SHEARER, General Superintendent

TYPICAL ADVERTISEMENTS EXPLAINING INCREASED RATES OF A PENNSYLVANIA COMPANY

# Local Lamp and Inspection Work Lighting

## Typical Cases of Good and Bad Local Lighting—A Case Where Local Units Are Desirable in Place of Overhead System—Requirements of Inspection Work and Its Importance

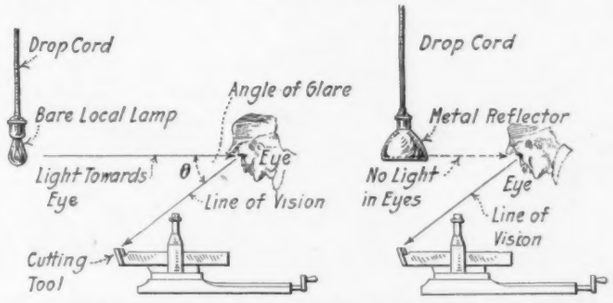
BY C. E. CLEWELL

Assistant Professor of Electrical Engineering, University of Pennsylvania

SUMMARY.—This article points out some of the faults in the prevalent misuse of local lamps and discusses a case where the proper use of local units was desirable in spite of the many advantages of the overhead system for ordinary cases of factory work. Methods of mounting local lamps are illustrated and some precautions are given which should be observed if the advantages of local units are to offset the usual disadvantages of such schemes. Owing to the very general mistakes in the installation and operation of local lamps, these notes are of unusual importance, and much emphasis is placed by the author on careful attention to details, which becomes so necessary where the local unit is placed within reach of the employee, who, through ignorance, so often adjusts the location of his own individual lamp with no regard to the proper shielding of his eyes from the direct light of the unit. The question of suitable illumination for factory inspection work is treated as representative of unusual requirements sometimes encontered here and there in lighting a given factory. Actual cases are used to illustrate special methods for meeting such conditions.

THE bad effects, as far as the eye is concerned, in the misuse of local lamps are likely to be greatly exaggerated in contrast with the same misuse of lamps mounted overhead. This follows because of the close proximity of such local lamps to the eye, bringing them often immediately in the line of vision when an operative is looking at his work, whereas lamps overhead are obviously less often in the line of vision and consequently are less likely, even when improperly equipped with reflectors, to produce glare effects as continuously and of the same magnitude as local units.

The widespread neglect in the use of reflectors as well as the use of reflectors which do not entirely conceal the bright lamp filaments of local lamps, as evidenced by careful investigations into certain trades, makes it desirable to call attention at least to the most important abuses and to suggest ways and means of applying local lamps to given cases in such a way that




FIGS. 1 AND 2—GOOD AND BAD CASE OF LOCAL LIGHTING

they may effectively illuminate the work and yet avoid the bad results alluded to above. Several typical cases, therefore, are appropriate to the subject at this point.

To illustrate some typical cases, Fig. 1 is drawn to show a common scheme for mounting a local unit close to a lathe or other machine tool and in bench work. The angle of glare as shown is based on the line of vision when the operative is looking at the cutting tool. When this angle is very small, as suggested in this diagram, the glare produced by the direct light from the lamp filament is a continual menace to eye comfort and safety.

The lamp is shown in such a position that the larger part of the light flux passes directly toward the opera-

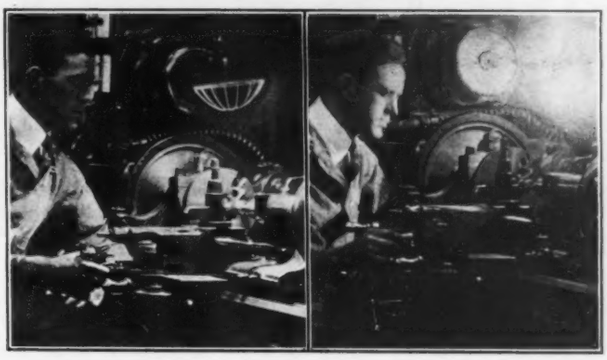


FIG. 3—GOOD AND BAD WAY OF ILLUMINATING A LATHE BY A LOCAL LAMP

tive's eyes, while a smaller portion passes away from the lamp toward the cutting tool which is supposedly the object for the illumination of which the lamp is installed. In Fig. 2 an improved arrangement is shown. Here the position of the lamp has been changed by bringing it more nearly over the cutting tool, and the metal reflector not only directs the luminous flux from the lamp effectively to the work but at the same time shields the bright lamp filament from the eyes of the workman.

Figs. 1 and 2 are made clearer by the photographic illustrations of Fig. 3.[1] The points just outlined are, of course, very simple and easily understood, but they constitute the keynote of the most widely ignored and most readily overlooked features in this problem of local lighting. The apparent remedies illustrated by Figs. 2 and 3 are probably the ones which are in need of the greatest attention by all those who are in a position to make suggestions to factory managements and operatives concerned with the use of a local lamp or lamps.

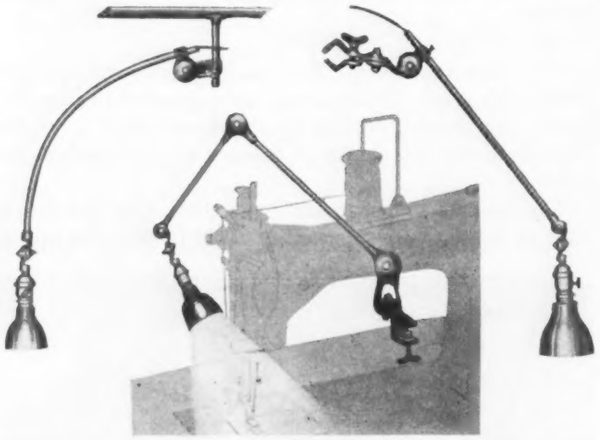
### GENERAL VERSUS LOCAL LIGHTING

Almost every one has a natural tendency to desire a local lamp close to the objects under view. There seems to be a sense of satisfaction under such lighting conditions which is not so evident with an exactly similar quantity and quality of light from lamps overhead and at some distance from the work in hand. Factory workmen who have grown accustomed to strictly local lighting, if transferred to another section lighted solely

[1]Figs. 3 and 9 are due to the courtesy of the Edison Lamp Works of the General Electric Company, Figs. 4, 5 and 6 to the Franklin Specialty Manufacturing Company, Provicence, R. I., and Figs. 10 and 11 to the Cooper Hewitt Electric Company.

from lamps at the ceiling, or if their own department is equipped with adequate general illumination and all drop lamps are removed, experience a feeling close to dissatisfaction even when the intensity is the same as before.

There is therefore a real difficulty in the way of convincing the average person that general illumination is



FIGS. 4, 5 AND 6—ADJUSTABLE LAMP HOLDERS, (1) FOR ATTACHMENT TO AN OVERHEAD RUNNING BOARD; (2) FOR CLAMPING TO A LINE OF PIPE OR CONDUIT; (3) FOR CLAMPING TO A SEWING-MACHINE TABLE

better than a system of local lamps. It is not merely a matter of stating that the general system is better; it is rather a feature which calls for continued work for some weeks under the general lighting condition before its advantages and satisfaction become realized. Thus large factory sections which formerly used local lamps almost or quite exclusively have been equipped with adequate general lighting, and the objections to the removal of the local lamps have been met successfully, not by their arbitrary removal, but under the agreement that they will be taken out and after a trial of the general scheme for several weeks will be reinstalled if actually found necessary.

The time element thus introduced gives the operatives an opportunity to become accustomed to the new scheme, and if the light from overhead is sufficient for the work, there is little likelihood that any considerable number of the local lamps will be asked for after the expiration of the time interval agreed upon. It is not necessary at this point to dwell on the advantages of the overhead system in contrast with the purely local lighting plan, but it may be observed that wherever possible local lighting should be discouraged in favor of the plan of general or localized general illumination. On the other hand, in those cases, some of which are found in nearly every industry, where a local lamp is a genuine necessity the same care should be bestowed upon the selection of its reflector and the method of its mounting as is given to the design of the general or the localized general schemes.

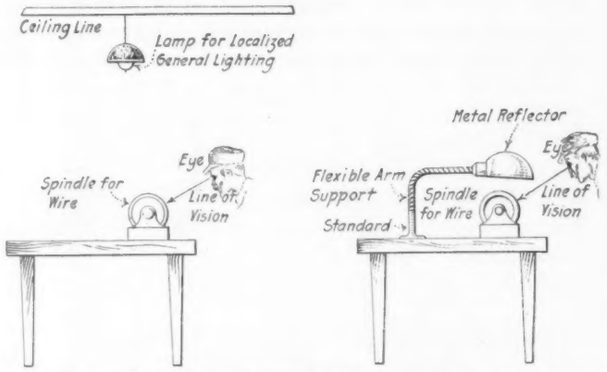
### THE PROBLEM OF MOUNTING LOCAL LAMPS

A common method of installing local lamps is by means of drop cords attached to the ceiling or other overhead supports. Such a plan is suggested by Figs. 1 and 2. Many cases arise, however, particularly with machine tools or in other processes, where it is desirable to be able to adjust the position of the lamp in various planes, and here some other form of mounting than from drop cords becomes very important. This problem in itself is often one of the most difficult to handle in practical every-day factory lighting work.

Different "home-made" schemes have been developed to apply to given machine tools in various plants. These are likely to be limited in the flexibility of adjustment for the lamp and its reflector. An excellent device has been developed for increasing the freedom of motion, as illustrated by Figs. 4, 5 and 6. The universal friction joint used at different points in this adjustable lamp holder is the most interesting part of the device. High frictional resistance is secured in this joint by having the surface of contact at the outer edge of disks within the joint case. These disks are hollowed out so as to produce a resilient tension. The clamp screw passes through one disk and is screwed through the opposing disk so that the nut locks the adjustment permanently and the tension of the initial adjustment remains practically constant for long intervals without readjustment.

The advantage of such a fixture lies in the numerous directions of the motion with which the adjustment of the lamp and its reflector takes place and, in addition, in the various methods by which the fixture may be mounted. To illustrate the latter point, Fig. 4 is included to show a form of clamp by which the fixture may be attached to any convenient line of pipe or conduit at hand and slightly above the position to be taken by the lamp. In contrast, another method whereby the fixture may be attached to any convenient running board or to a low ceiling is shown in Fig. 5. In Fig. 6 one form of this holder is shown for attachment to the table of an ordinary sewing machine. Some idea of the freedom of motion of the lamp may be gained from this illustration.

Other schemes for mounting are also used; for example, a flexible arm as suggested by Fig. 8, and various combinations of pipe lengths and collars with thumb-nut locks. One firm has developed a magnetic holder by which the lamp may be placed against any convenient metal surface of a machine tool and will be held firmly by the magnetic attraction of the holder for the metal base on which it rests.




FIGS. 7 AND 8—INDIVIDUAL FLEXIBLE FIXTURES PROVE BETTER FOR THIS TYPE OF WORK

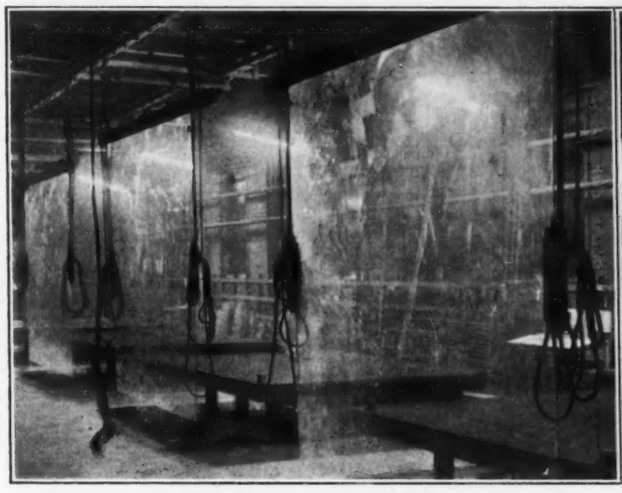
One of the departments on which the maintenance of a high standard of the manufactured product largely rests is that of inspection. Unusual requirements of the illumination are often made essential by the exacting nature of such work. The inspection table in Fig. 7 is used to support a number of spindles or reels on which or from which fine enameled wire is wound by

small motors. The wire comes to these inspection tables from the wire enameling department, and its inspection consists in the detection of bare or imperfect points on the enameled surface as the wire passes the inspector's line of vision.

Obviously, when this wire is manufactured on a large scale, the speed with which it may be reeled up on the spindles shown by Fig. 7 determines the amount of wire which may be handled by each inspector in the day's work. It was thought at first in this particular case that the unusual advantages of the overhead (and in this instance the localized general) method of lighting were such that a plan like that of Fig. 7 would prove satisfactory. The speed of the wire, however, and the consequent need for very clear vision in following its passage past a given point, placed materially different requirements on the illumination from those that apply to much ordinary manufacturing work.

After a fair trial, therefore, the plan of Fig. 7 was changed to individual flexible fixtures for each spindle as shown by Fig. 8, this scheme fulfilling the needs of the case and proving that there are instances where the use of a local lamp becomes imperative to the success of the operation involved. There are, however, many cases of inspection where the localized general plan of illumination, and even the general plan, is satisfactory.

To make this clear, Fig. 10 is shown to give an idea of the details of inspection which may be conducted under a localized general distribution of the overhead lamps. In this case the work is carried on with an intensity of about 4.5 ft.-candles with the lamps mounted 9 ft. (2.7 m.) above the floor. Work allied with that of inspection, where general illumination is supplied by mercury-vapor lamps mounted at the overhead iron work, is suggested by Fig. 11. Note particularly the clearness in the detail with which the various mechanical parts of the engines stand out under the artificial lighting in this view. Fig. 9 shows the inspection floor of a plate-glass manufacturing plant where a scheme approximating localized general illumination is used. This is a rather unusual example of inspection work and requires unusual accuracy of vision.



FIGS. 9 AND 10—FINAL INSPECTION OF PLATE GLASS; INSPECTING AND SIZING ROLLER BEARINGS

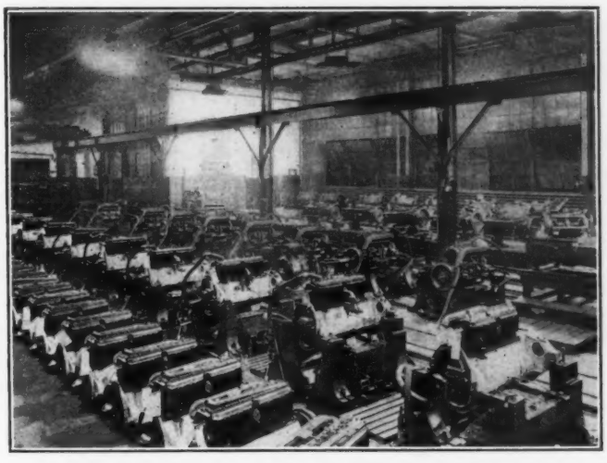


FIG. 11—CLEARNESS OF DETAIL POSSIBLE WITH MERCURY-VAPOR LAMPS FOR ENGINE ADJUSTING AND TESTING

The foregoing notes point to the wisdom of exercising due care when a progressive campaign of general lighting is adopted in any plant to see to it that the merits of individual cases which seem to require local lamps are duly weighed. It sometimes happens that what is apparently a most excellent system of general lighting is not suited to every operation conducted in the shop section, in spite of its adequacy and satisfactory character for the greater part of the work. Such cases, by their very unusual nature, will now and then present the opportunity for a treatment somewhat different from that of the rest of the department concerned, and to refuse to recognize them, with the idea that what is good enough for the majority should be satisfactory for all, may actually work a hardship on certain operatives, which will of course in the end work to the disadvantage of the plant itself.

## Foreign Service Committee

A committee has been sent to Europe to report from the front on scientific matters and to arrange for cooperation in the study of questions underlying military and industrial problems. This committee includes two physicists, two chemists, one metallurgist and two representatives of medicine and hygiene. Among committees of the Research Council not immediately engaged on national defense questions is that on the promotion of industrial research (Dr. J. J. Carty, chairman).

# Light and Power Operations in May

## Income from Energy Sold Totals Up to $36,800,000 Against $31,900,000 for May, 1916, While Output Amounts to 2,280,000,000 Kw.-Hr., as Against 1,820,000,000 in May, 1916

CENTRAL station electric light and power operations gave better results during the month of May in comparison with May, 1916, than any other month in the past year in comparison with the month a year previous, according to the returns received by the ELECTRICAL WORLD. For the month of May last these reports indicate earnings from light and power sales of $36,800,000, in comparison with $31,900,000 for May, 1916, an increase of 15.7 per cent. The energy output sold during May last was 2,280,000,000 kw.-hr., in comparison with 1,820,000,000 kw.-hr. in May, 1916, or an increase of 25 per cent.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

| | Percentage of Industry Represented | Income from the Sale of Energy | | | Kw.-Hr. Output | | |
|---|---|---|---|---|---|---|---|
| | | 1916 | 1915 | Per Cent Increase | 1916 | 1915 | Per Cent Increase |
| June | 64 | 20,254,000 | 17,551,000 | 15.4 | 1,170,679,000 | 968,724,000 | 21.0 |
| July | 64 | 19,760,000 | 17,301,000 | 14.2 | 1,174,374,000 | 976,704,000 | 24.4 |
| Aug | 64 | 20,502,000 | 17,861,000 | 15.0 | 1,262,575,000 | 1,015,805,000 | 22.4 |
| Sept | 64 | 21,432,000 | 18,600,000 | 15.2 | 1,268,339,000 | 1,037,976,000 | 21.2 |
| Oct | 64 | 22,882,000 | 20,164,000 | 13.5 | 1,347,502,000 | 1,125,132,000 | 19.9 |
| Nov | 64 | 24,819,000 | 21,744,000 | 14.4 | 1,396,537,000 | 1,148,221,000 | 21.7 |
| Dec | 62 | 25,306,000 | 22,029,000 | 15.0 | 1,345,883,000 | 1,112,280,000 | 21.0 |
| 1917 | | 1917 | 1916 | | 1917 | 1916 | |
| Jan | 63 | 27,408,000 | 23,969,000 | 14.4 | 1,495,829,000 | 1,180,884,000 | 26.7 |
| Feb | 63 | 25,204,000 | 22,295,000 | 13.1 | 1,240,995,000 | 1,036,014,000 | 20.0 |
| March | 62 | 23,897,000 | 20,865,000 | 14.5 | 1,406,065,000 | 1,136,652,000 | 24.3 |
| April | 62 | 22,850,000 | 20,097,000 | 13.9 | 1,324,730,000 | 1,082,666,000 | 22.6 |
| May | 55 | 20,206,000 | 17,537,000 | 15.7 | 1,251,376,000 | 1,000,275,000 | 25.0 |

In the two eastern sections, the New England States and the Atlantic States, considerably greater increases

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May |
|---|---|---|---|---|---|---|---|---|---|---|
| INCOME: | | | | | | | | | | |
| Group 1 | 13.9 | 15.0 | 11.6 | 13.0 | 15.0 | 12.0 | 12.5 | 13.0 | 12.0 | 14.0 |
| Group 2 | 15.7 | 20.4 | 19.2 | 17.7 | 16.6 | 19.0 | 19.7 | 20.7 | 20.0 | 21.2 |
| Group 3 | 20.9 | 18.4 | 18.5 | 18.2 | 15.2 | 15.2 | 12.5 | 15.1 | 15.0 | 16.0 |
| Group 4 | 9.5 | 11.3 | 13.5 | 12.8 | 12.3 | 15.5 | 10.3 | 19.1 | 16.5 | 17.6 |
| Group 5 | 14.9 | 13.3 | 16.0 | 12.8 | 9.5 | 20.2 | 57.5 | 16.1 | 19.7 | 17.4 |
| OUTPUT: | | | | | | | | | | |
| Group 1 | 21.4 | 18.5 | 16.6 | 18.2 | 18.7 | 22.5 | 19.0 | 20.0 | 18.7 | 22.6 |
| Group 2 | 33.0 | 32.9 | 31.1 | 27.2 | 20.2 | 30.5 | 24.0 | 35.7 | 37.1 | 40.0 |
| Group 3 | 31.1 | 19.3 | 24.0 | 32.0 | 28.8 | 34.4 | 14.8 | 25.1 | 24.5 | 23.4 |
| Group 4 | 23.0 | 26.0 | 20.4 | 19.7 | 21.0 | 30.5 | 20.2 | 26.1 | 27.2 | 30.6 |
| Group 5 | 16.8 | 15.3 | 18.3 | 33.0 | 25.4 | 21.3 | 21.7 | 44.0 | 22.0 | 27.0 |

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May |
|---|---|---|---|---|---|---|---|---|---|---|
| INCOME: | | | | | | | | | | |
| Group 1 | 9.6 | 16.5 | 12.1 | 13.5 | 12.5 | 12.5 | 12.3 | 7.0 | 13.8 | 12.2 |
| Group 2 | 15.1 | 25.5 | 21.3 | 20.0 | 30.2 | 16.1 | 18.4 | 18.2 | 17.9 | 21.0 |
| Group 3 | 15.0 | 20.5 | 18.0 | 19.4 | 16.5 | 17.8 | 15.7 | 16.5 | 25.3 | 25.0 |
| Group 4 | 11.1 | 10.5 | 15.4 | 16.0 | 16.0 | 22.0 | 12.8 | 25.8 | 23.0 | 31.3 |
| Group 5 | 17.5 | 18.3 | 18.2 | 18.6 | 12.2 | 24.0 | 15.1 | 21.0 | 24.0 | 29.5 |
| OUTPUT: | | | | | | | | | | |
| Group 1 | 31.3 | 34.0 | 17.5 | 18.0 | 10.8 | 20.7 | 19.6 | 24.0 | 18.2 | 17.7 |
| Group 2 | 32.0 | 37.7 | 35.0 | 24.7 | 18.2 | 24.8 | 18.5 | 21.1 | 21.3 | 30.3 |
| Group 3 | 45.5 | 32.4 | 42.6 | 35.9 | 22.0 | 20.9 | 35.7 | 34.5 | 38.2 | 38.3 |
| Group 4 | 39.4 | 32.9 | 48.9 | 40.0 | 55.2 | 73.8 | 38.1 | 32.7 | 49.3 | 66.8 |
| Group 5 | 21.3 | 27.4 | 22.0 | 17.0 | 35.7 | 29.2 | 26.8 | 76.0 | 29.0 | 39.5 |

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

| | Month | Percentage of Industry Represented | New England States | | | Percentage of Industry Represented | Atlantic States | | | Percentage of Industry Represented | Central States (Illinois Excluded) | | | Percentage of Industry Represented | Pacific and Mountain States | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1916 | 1915 | Per Cent Increase | | 1916 | 1915 | Per Cent Increase | | 1916 | 1915 | Per Cent Increase | | 1916 | 1915 | Per Cent Increase |
| INCOME | June | 65 | 2,208,000 | 1,906,000 | 16.0 | 67 | 8,045,000 | 6,905,000 | 16.5 | 56 | 6,007,000 | 5,143,000 | 16.9 | 88 | 4,017,000 | 3,539,000 | 13.5 |
| | July | 65 | 2,130,000 | 1,875,000 | 13.7 | 67 | 7,832,000 | 6,621,000 | 16.4 | 56 | 5,926,000 | 5,095,000 | 16.3 | 88 | 3,755,000 | 3,493,000 | 7.6 |
| | August | 65 | 2,203,000 | 1,935,000 | 13.7 | 66 | 8,000,000 | 6,875,000 | 16.4 | 56 | 6,195,000 | 5,266,000 | 17.7 | 88 | 3,883,000 | 3,582,000 | 8.4 |
| | September | 65 | 2,315,000 | 1,982,000 | 16.8 | 66 | 8,631,000 | 7,445,000 | 16.0 | 56 | 6,505,000 | 5,537,000 | 17.8 | 88 | 3,979,000 | 3,644,000 | 9.2 |
| | October | 65 | 2,684,000 | 2,331,000 | 15.2 | 65 | 8,887,000 | 7,930,000 | 12.1 | 56 | 6,968,000 | 5,895,000 | 18.2 | 87 | 4,213,000 | 3,889,000 | 8.3 |
| | November | 65 | 2,912,000 | 2,516,000 | 15.7 | 65 | 10,061,000 | 8,859,000 | 13.5 | 56 | 7,410,000 | 6,313,000 | 17.4 | 87 | 4,246,000 | 3,947,000 | 7.5 |
| | December | 65 | 3,203,000 | 2,814,000 | 14.0 | 66 | 11,059,000 | 9,348,000 | 19.6 | 56 | 7,898,000 | 6,997,000 | 13.0 | 75 | 2,987,000 | 2,735,000 | 9.3 |
| | 1917 | | 1917 | 1916 | | | 1917 | 1916 | | | 1917 | 1916 | | | 1917 | 1916 | |
| | January | 64 | 3,181,000 | 2,762,000 | 15.1 | 66 | 11,400,000 | 9,874,000 | 15.6 | 56 | 8,081,000 | 7,013,000 | 15.2 | 86 | 4,602,000 | 4,020,000 | 9.5 |
| | February | 64 | 3,039,000 | 2,686,000 | 13.1 | 65 | 10,249,000 | 9,021,000 | 13.6 | 55 | 7,471,000 | 6,530,000 | 14.4 | 86 | 4,284,000 | 3,926,000 | 9.2 |
| | March | 62 | 2,809,000 | 2,499,000 | 12.4 | 64 | 10,203,000 | 8,902,000 | 14.7 | 55 | 6,692,000 | 5,754,000 | 16.5 | 86 | 4,193,000 | 3,780,000 | 11.0 |
| | April | 62 | 2,706,000 | 2,312,000 | 17.1 | 61 | 8,586,000 | 7,752,000 | 10.7 | 54 | 7,132,000 | 6,094,000 | 7.0 | 87 | 4,270,000 | 3,811,000 | 12.1 |
| | May | 56 | 2,464,000 | 2,096,000 | 17.7 | 59 | 8,393,000 | 7,251,000 | 15.6 | 47 | 6,039,000 | 5,173,000 | 16.7 | 76 | 3,161,000 | 2,881,000 | 9.7 |
| KW.-HR. OUTPUT | | | 1916 | 1915 | | | 1916 | 1915 | | | 1916 | 1915 | | | 1916 | 1915 | |
| | June | 65 | 87,829,000 | 69,506,000 | 27.6 | 67 | 396,630,000 | 327,541,000 | 21.2 | 56 | 350,015,000 | 288,982,000 | 21.2 | 88 | 328,996,000 | 277,915,000 | 18.6 |
| | July | 65 | 85,317,000 | 71,160,000 | 19.8 | 67 | 401,179,000 | 333,771,000 | 20.3 | 56 | 350,708,000 | 287,407,000 | 22.2 | 88 | 325,647,000 | 279,285,000 | 17.4 |
| | August | 65 | 97,197,000 | 72,900,000 | 33.4 | 66 | 433,129,000 | 344,730,000 | 25.7 | 56 | 374,327,000 | 295,866,000 | 26.5 | 88 | 333,468,000 | 279,976,000 | 19.1 |
| | September | 65 | 98,350,000 | 73,343,000 | 34.2 | 66 | 446,534,000 | 369,815,000 | 20.8 | 56 | 387,626,000 | 307,485,000 | 26.2 | 88 | 335,817,000 | 288,332,000 | 16.4 |
| | October | 65 | 107,756,000 | 83,705,000 | 28.8 | 65 | 426,151,000 | 373,705,000 | 14.2 | 56 | 408,364,000 | 324,509,000 | 25.9 | 87 | 355,014,000 | 306,828,000 | 15.8 |
| | November | 65 | 111,873,000 | 89,015,000 | 25.7 | 65 | 533,252,000 | 424,746,000 | 25.6 | 56 | 415,491,000 | 334,044,000 | 24.4 | 87 | 346,847,000 | 293,518,000 | 18.2 |
| | December | 65 | 117,763,000 | 97,387,000 | 21.0 | 66 | 535,410,000 | 444,923,000 | 20.4 | 56 | 425,510,000 | 354,258,000 | 20.0 | 75 | 256,006,000 | 206,838,000 | 23.8 |
| | 1917 | | 1917 | 1916 | | | 1917 | 1916 | | | 1917 | 1916 | | | 1917 | 1916 | |
| | January | 64 | 120,211,000 | 93,163,000 | 29.1 | 66 | 564,699,000 | 429,432,000 | 31.5 | 56 | 437,923,000 | 351,335,000 | 24.5 | 86 | 363,094,000 | 298,990,000 | 21.4 |
| | February | 64 | 110,114,000 | 88,324,000 | 24.7 | 65 | 418,407,000 | 341,877,000 | 22.5 | 55 | 373,988,000 | 323,158,000 | 15.8 | 86 | 326,891,000 | 274,079,000 | 19.3 |
| | March | 62 | 118,370,000 | 92,714,000 | 27.9 | 64 | 539,028,000 | 425,376,000 | 27.0 | 55 | 383,046,000 | 311,841,000 | 23.0 | 86 | 365,541,000 | 301,721,000 | 21.3 |
| | April | 62 | 106,182,000 | 84,786,000 | 25.5 | 61 | 449,030,000 | 362,429,000 | 24.0 | 54 | 390,103,000 | 317,505,000 | 22.9 | 87 | 368,396,000 | 309,360,000 | 19.1 |
| | May | 56 | 99,916,000 | 77,456,000 | 29.0 | 59 | 468,128,000 | 366,135,000 | 28.0 | 47 | 362,132,000 | 286,578,000 | 26.4 | 76 | 310,459,000 | 261,544,000 | 18.7 |

were recorded for May than during the immediately preceding months. In the Central States the percentage of increase showed but little change, while there was a slightly lower rate of increase in the states in the Far West. However, on the basis of the first five months of the year, which show an increase in earnings of roughly $25,000,000 and an increase in output of over 2,000,000,000 kw.-hr., it is estimated that at the same rate of increase the central station industry will have earned in the neighborhood of $60,000,000 more in 1917 than in 1916 from the sale of energy for light and power only,

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May |
|---|---|---|---|---|---|---|---|---|---|---|
| INCOME: | | | | | | | | | | |
| Group 1..... | 16.1 | 16.2 | 10.7 | 13.7 | 18.8 | 15.0 | 13.0 | 14.3 | 8.9 | 15.2 |
| Group 2..... | 21.6 | 19.0 | 21.0 | 22.5 | 21.7 | 28.3 | 27.3 | 27.0 | 22.5 | 21.0 |
| Group 3..... | 15.0 | 14.0 | 14.6 | 13.0 | 13.4 | 12.5 | 10.4 | 15.1 | 13.9 | 16.9 |
| Group 4..... | 14.4 | 9.8 | 13.5 | 13.1 | 14.4 | 14.0 | 11.3 | 20.5 | 15.8 | 13.1 |
| Group 5..... | 19.4 | 8.9 | 14.3 | 16.0 | 14.3 | 11.1 | 11.8 | 12.5 | 6.3 | 12.5 |
| OUTPUT: | | | | | | | | | | |
| Group 1..... | 28.5 | 23.6 | 19.2 | 20.8 | 21.5 | 32.5 | 22.0 | 21.3 | 21.6 | 29.7 |
| Group 2..... | 32.5 | 26.7 | 33.0 | 31.9 | 28.2 | 42.6 | 31.2 | 63.2 | 36.5 | 28.3 |
| Group 3..... | 16.0 | 24.7 | 4.5 | 19.0 | 15.9 | 27.2 | 21.2 | 21.6 | 25.5 | 24.8 |
| Group 4..... | 29.5 | 18.6 | 17.5 | 14.6 | 16.0 | 25.4 | 18.8 | 20.2 | 24.9 | 19.7 |
| Group 5..... | 20.4 | 1.3 | 1.5 | 5.8 | 6.9 | 9.4 | 17.0 | 3.2 | 10.0 | 7 2 |

while the output sold for these purposes will be in the neighborhood of 5,000,000,000 kw.-hr. greater in 1917 than in 1916.

The maintenance of these large percentages of in-

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May |
|---|---|---|---|---|---|---|---|---|---|---|
| INCOME: | | | | | | | | | | |
| Group 1..... | 16.5 | 16.6 | 18.0 | 16.5 | 13.0 | 15.5 | 14.5 | 16.0 | 16.6 | 16.2 |
| Group 2..... | 21.8 | 21.5 | 21.0 | 17.0 | 16.0 | 17.8 | 18.7 | 21.0 | 21.7 | 24.4 |
| Group 3..... | 18.4 | 13.4 | 10.9 | 13.0 | 1.8 | 6.0 | 0.5 | 4.4 | 6.5 | 7.6 |
| Group 4..... | 10.7 | 20.0 | 19.7 | 16.8 | 15.5 | 19.8 | 16.3 | 18.9 | 20.8 | 16.2 |
| Group 5..... | 11.8 | 11.0 | 18.4 | 14.3 | † | 19.3 | 16.7 | 11.0 | 27.0 | 3.3 |
| OUTPUT: | | | | | | | | | | |
| Group 1..... | 24.3 | 22.3 | 24.9 | 24.8 | 22.3 | 25.4 | 19.2 | 22.0 | 19.5 | 22.0 |
| Group 2..... | 36.4 | 40.0 | 31.7 | 29.7 | 24.4 | 29.0 | 23.6 | 32.4 | 44.4 | 51.9 |
| Group 3..... | 25.7 | 20.7 | 17.3 | 19.7 | 1.2 | 5.8 | 30.0* | 4.5 | 4.4 | 5.4 |
| Group 4..... | 23.0 | 33.8 | 26.1 | 21.2 | 21.4 | 24.5 | 13.0 | 25.7 | 21.4 | 18.6 |
| Group 5..... | 6.1 | 13.7 | 28.2 | 16.8 | 9.9 | 15.5 | 17.1 | 23.5 | 15.5 | 18.5 |

*Decrease.
†Results omitted owing to insufficient returns.

crease over the corresponding months of last year month by month indicates in what measure the central stations have been successful in connecting up large power loads. It must not be lost sight of that the

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May |
|---|---|---|---|---|---|---|---|---|---|---|
| INCOME: | | | | | | | | | | |
| Group 1..... | 5.5 | 6.2 | 4.2 | 4.5 | 4.0 | 5.4 | 7.2 | 8.5 | 11.2 | 6.7 |
| Group 2..... | 0.7 | 4.9 | 1.3 | 3.0 | 3.6 | 7.5 | 5.5 | 0.6 | 3.4 | 7.8 |
| Group 3..... | 32.5 | 28.5 | 32.4 | 31.0 | 30.0 | 27.6 | 23.5 | 22.8 | 19.7 | 17.9 |
| Group 4..... | 0.5 | 11.5 | 7.2 | 0.4 | 0.6* | 8.6 | 2.0 | 13.2 | 10.0 | 13.0 |
| Group 5..... | 13.0 | 11.7 | 13.5 | 17.1 | 11.1 | 20.3 | 14.9 | 15.2 | 13.9 | 17.9 |
| OUTPUT: | | | | | | | | | | |
| Group 1..... | 6.3 | 7.1 | 5.2 | 8.0 | 8.6 | 11.0 | 22.3 | 15.6 | 15.4 | 14.6 |
| Group 2..... | 6.5 | 7.8 | 9.7 | 11.4 | 8.7 | 11.8 | 16.2 | 8.9 | 16.1 | 13.0 |
| Group 3..... | 57.5 | 60.0 | 63.7 | 61.3 | 48.0 | 59.5 | 36.8 | 36.3 | 29.7 | 25.7 |
| Group 4..... | 7.5 | 12.0 | *0.5 | 4.2 | 2.6 | 15.2 | 14.0 | 27.9 | 21.0 | 26.3 |
| Group 5..... | 16.5 | 7.0 | 14.7 | 42.3 | 5.4 | 19.1 | 9.4 | 21.6 | 20.6 | 20.0 |

*Decrease.

total volume of growth is considerably greater each month, although the percentages are about the same, because the totals dealt with are larger. In 1916 the load on the central station increased considerably because of the immediate demands for power, which, owing to prevailing conditions, it was possible to obtain only from the central stations. In the present year, however, other sources have developed which have considerably increased the load on central station lines. One of the most potent factors has been the coal situation. The small plant found itself in a very dangerous and unsatisfactory position, and in order to secure continuity of operation realized the necessity of using central station power.

A considerable part of this load manifested itself for

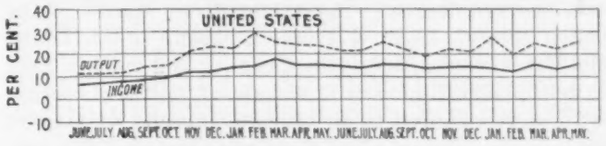
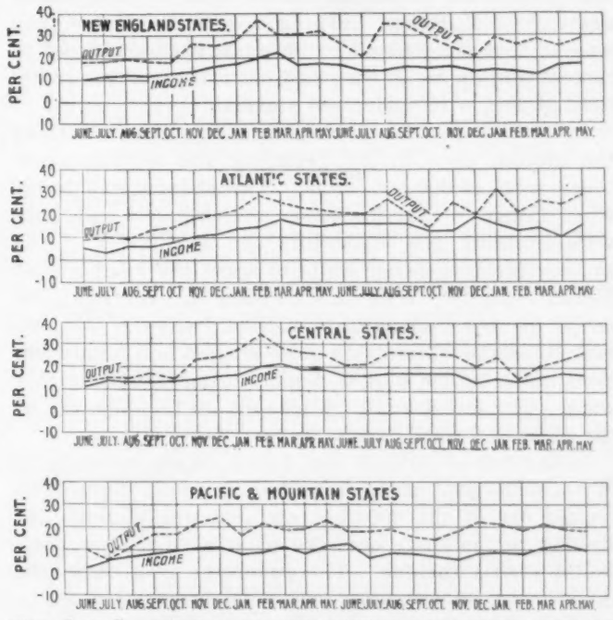



FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

the first time during May last, and the slight jump in the percentage of increase is undoubtedly in large measure owing to this character of load. The May earnings also include some companies that had put coal clauses into effect, but to what extent this has increased the earnings of those companies is not known. In succeeding months, however, as more of the companies reporting have put coal clauses into effect the results of these temporary higher rates will undoubtedly be noticeable to some extent in the earning columns.

The accompanying curves show graphically the percentages of increase in both income and output as shown in Tables I and II. The remaining tables show the percentages of increase in both income and output for companies grouped according to the size of the




FIGS. 2 TO 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

territory in which they operate. Group 1 includes those companies operating in cities having a population of 100,000 or more; group 2 includes those operating in cities with a population of between 50,000 and 100,000; group 3 includes those between 25,000 and 50,000; group 4, between 10,000 and 25,000; group 5, between 5000 and 10,000.

# Modernizing Fifteen-Year-Old Steam Plant

## Plant Designed for 12,000 Kw. Remodeled to Take Care of an Ultimate Capacity of 116,000 Kw.—Latest Unit, a 20,000-Kw. Generator, to Be Followed by Two More of Same Size—Unusual Difficulties

BY JOHN HUNTER

THAT central station equipment has developed rapidly during the last fifteen years is shown to a marked degree in the Ashley Street station of the Union Electric Light & Power Company of St. Louis, Mo. This station, originally designed and built in 1903 to deliver a maximum of 12,000 kw. of electrical energy, is to be re-equipped to an ultimate capacity of 116,000 kw. In the original plant there were installed five vertical cross-compound reciprocating engines driving 25-cycle generators. These units occupied practically the entire available space in the engine room and stood upon massive concrete foundations built upon bedrock lying beneath the plant. To furnish steam to these reciprocating units, the original installation included twenty-eight Scotch marine boilers equipped with Jones underfeed stokers. The auxiliary equipment was in every way typical of the most improved design in machinery known at that time. In 1905, after the station had been in operation only a little over a year, steam-turbine development had reached such a point that it was practicable to install four 5000-kw. generating units. To meet the steam demands of these units, it was necessary to rearrange the boiler room to receive forty water-tube boilers with chain-grate stokers, the new boilers being installed on a second deck above the original installation of Scotch marine boilers. The chain-grate type of stoker, burning low-grade Illinois coal, was at that time found to be much better adapted to central station work than the older type of internally fired boilers with underfeed stokers.

In 1908 it was found necessary to increase further the station capacity by replacing the 5000-kw. turbines with 12,000-kw. units. The change was somewhat unique in that the steam and electrical ends only were replaced, the condensers and auxiliaries of the smaller turbines being made to serve the machines of higher capacity. With this increase in generating capacity it was necessary to replace twelve of the old Scotch marine boilers with more modern and highly efficient units, twelve B. & W. boilers being chosen for this work. The latest addition brought up the capacity of the plant to 64,000 kw.

In the fall of 1915 it was found necessary again to increase the generating capacity. The first step was to replace one of the 3000-kw. reciprocating engines, installing in the space occupied by it a 20,000-kw. horizontal Curtis turbine. The generator is a 4500-volt, three-phase, 60-cycle unit with four poles and rated at 20,000 kw. at 80 per cent power factor. The speed is 1800 r.p.m. To supply steam to this new unit the remainder of the old Scotch marine boilers were removed and ten modern 558-hp. water-tube boilers were installed in their stead.

The depth of the foundation of the new turbine is much greater than that of the old engine foundation, requiring the excavation of approximately 2100 cu. yd. (1606 cu. m.) of rock in addition to the blasting away of the engine foundation proper, occupying 900 cu. yd. (688 cu. m.).

To excavate in the heart of an engine room filled with large generating units and auxiliaries in operation was quite unusual in power plant reconstruction and was a task that required great care and attention with a view to preventing accidents or shutdowns. The work of blasting away the rock was done in close proximity both to adjacent turbine foundations and to the rock foundation of the building wall, all of which was accomplished without the necessity of resorting to underpinning. The nature of the rock was such that it was not

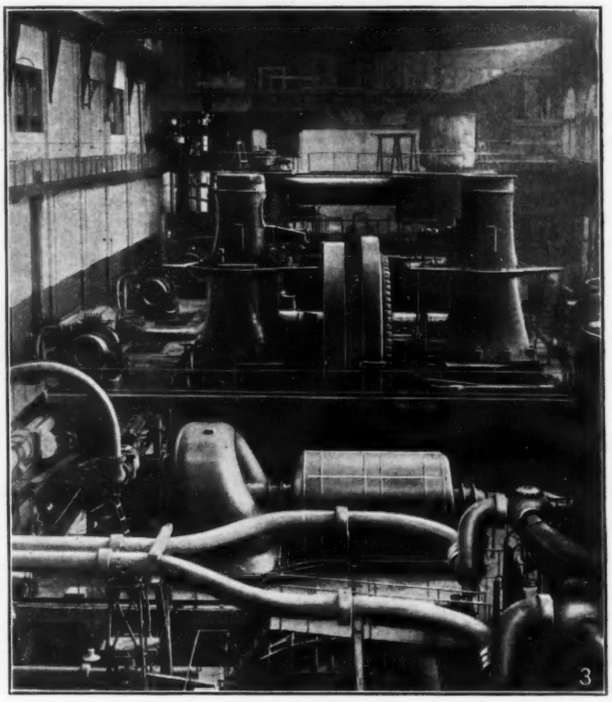


FIG. 1—GENERAL VIEW OF NEW TURBINE IN PLACE AND DISMANTLING OF RECIPROCATING ENGINES

always possible to use dynamite at all points in the blasting, and it was often necessary to resort to cutting away certain portions by "bull-pointing," the drills being driven for the most part by air machines.

The building of the foundation for the new 20,000-kw. turbine was started on May 15, 1916, and completed about six weeks later. The foundation was built up of heavy concrete columns and girders, supporting both the turbine proper and the 40,000-sq.-ft. (3716 sq. m.) condenser immediately below, a total weight of about 400 tons (362.8 t.). The reinforcing steel and the forms for the concrete were completely erected and in place before any pouring was done. The concrete was then poured continuously, requiring approximately three days' time.

The condenser, built by the C. H. Wheeler Company,

is of the two-pass type, circulating water being supplied by a Wheeler 50,000,000-gal. (189,266,600-l.) pump driven by a 300-hp. Kerr turbine. The vacuum pump is of the rotary "hurling water" type and successfully operates to within 1 in. (2.54 cm.) of the barometer while carrying full load. This equipment is supplemented by an air washer which passes 50,000 cu. ft. of

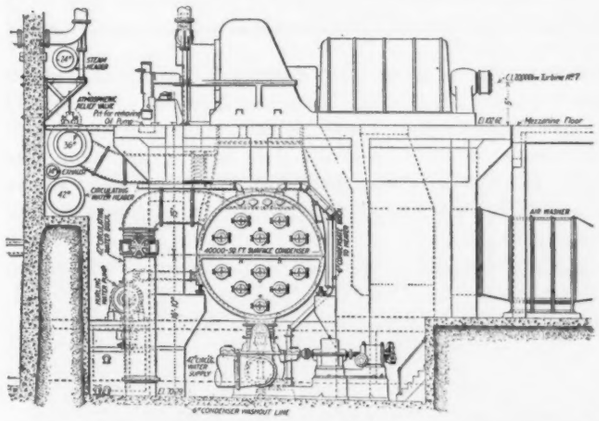


FIG. 2—CROSS-SECTION OF 20,000-KW. TURBINE INSTALLATION

air per minute (23,600 l. per second), humidifying, cleaning and cooling it before delivery to the ventilating duct of the generator. From the generator the air is discharged through an air duct 50 sq. ft. (4.6 sq. m.) in section to the boiler room, which is adjacent to the forced-draft fans.

Condensation from the turbine, amounting to roughly 240,000 lb. (108,862 km.) per hour, is diverted

FIG. 3—GAGE BOARD FOR 20,000-KW. TURBINE

in part before it passes through the reheater on top of the condenser, and passed through the cooling coils and bearing jackets of the turbine proper. In this way a generous supply of pure circulating water is available for cooling and the heat absorbed is further utilized, inasmuch as it is returned direct to the feed-water heaters. The space occupied by two of the reciprocating engines has been utilized for the extension of the engine-house switch structure.

An interesting feature of the new installation is the turbine gage board. On the main panel are mounted the steam-pressure gages showing steam pressures on the main header and on the first stage of the turbine. At the left is the indicating vacuum gage with the recording instrument at the bottom center of the panel. Both these instruments show pressure on the condenser and are checked by means of a mercury column placed below the gage board. Vacuums are maintained on this condenser well within 1 in. (2.54 cm.) of the barometer. The frequency indicator with synchronizing lamps is shown at the center of the board. Beneath the slate panel is mounted a ship signal arrangement for communication between the operating floor and the switchboard. The alarm bell mounted beneath the ship signal calls the operator's attention to signals. Two sets of switches with button and pilot lights showing on each gage-board support are remote-control operating mechanisms for the circulating-water inlet and discharge valves.

The circulating-water system formerly supplying cooling water to the condensers has been replaced by large tunnels with both intake and discharge from the river. The capacity of the new system is over 240,000,000 gal. (908,480,000 l.) per day. Traveling screens installed in the new tunnels to remove rubbish usually found in the Mississippi River revolve on 53-ft. (16.2-m.) centers, this unusual length being necessary because of wide variations in the stages of the river.

Plans are now completed for the installation of two additional 20,000-kw. turbines in the space occupied by the remaining two reciprocating-engine units.

## CONSUMERS OF GAS AS CLASSIFIED IN CHICAGO

### In New Contract Consumers Are to Be Treated as Domestic or Industrial and Charged Accordingly

A review of the new contract which has been made between the People's Gas Light & Coke Company of Chicago and the City Council of Chicago, written by C. T. Chenery of the staff of Sanderson & Porter, who represented the company in the negotiations with the city, shows that unusual features are included in the arrangement. Among them is a profit-sharing plan and the rate-making section.

In discussing the rates, Mr. Chenery says that it was suggested by the city representatives and agreed to by the company that for purposes of expediency, consumers with small meters—*i.e.*, three, five and ten-light—should be regarded as domestic consumers, and customers with larger meters should be treated as industrial consumers, a simplification which an examination of the company's records appeared to justify. For the domestic consumer so described the rates are as follows:

| | Cents Net |
|---|---|
| For the first 350 cu. ft. or less | 30 |
| From 350 cu. ft. to 10,000 cu. ft. | 70 |
| From 10,000 cu. ft. to 50,000 cu. ft. | 65 |
| All over 50,000 cu. ft. | 40 |

This charge of 30 cents for the first 350 cu. ft. or less acts both as a service charge and as a minimum bill.

Samuel Insull is chairman of the board of directors.

# STATION AND OPERATING PRACTICE

*A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy*

## TESTING INDUSTRIAL ELECTRIC TRUCKS

### How a Factory Man Secured Accurate Energy-Consumption Records on Industrial Truck Despite Lack of Interest of Operators

When the electrical department of the Willys-Overland Company, Toledo, Ohio, desired accurate information on the amount of energy used by one of the industrial electric trucks employed in hauling material about the factory, the problem of securing reliable information without putting a skilled investigator on the truck presented itself. To meet the situation special charging connections were attached to the truck and one of the charging outfits in the garage so that they only could be connected together. A watt-hour meter was then placed in the circuit between the rectifying equipment and the charging plug. This, of course, measured the direct input to the truck. Since the losses in the charging equipment were known, these were added to the readings of the watt-hour meter and this gave accurate data on energy consumption. Energy cost per ton-mile was then worked out from the mileage registered on a special speedometer and from truck loads taken from actual scale readings.

## POLE-TOP EXTENSIONS THAT EFFECT SAVING

### Recent California Law Requires Vertical Separation of 2 Ft. More Between Primary and Secondary Cross-arms

A State law covering line construction in California requires a vertical separation of 4 ft. (1.2 m.) between primary and secondary cross-arms. Prior to the passage of this law this separation was ordinarily made 2 ft. (0.61 m.). The utility companies are therefore under the necessity of making extensive modifications in their construction.

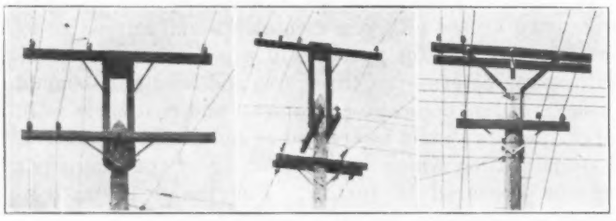


FIG. 1—THREE TYPES OF POLE EXTENSIONS

Owing to interfering cross leads of telephone and other supply lines or insufficient clearance above streets, it is often difficult to lower the secondary arms. To obviate the necessity of changing poles, one California company makes use of pole extensions which serve to increase the effective height of a pole by allowing the placing of a top cross-arm exactly 4 ft. (1.2 m.) above the top gain of a pole. This construction often effects a considerable saving, as the cost of such extension is less than the expense involved in setting and transferring to higher poles, provided that the pole to be changed is still sound and otherwise adequate to the service required.

As will be seen from the accompanying illustrations, the extensions used are of two types, steel and wood.

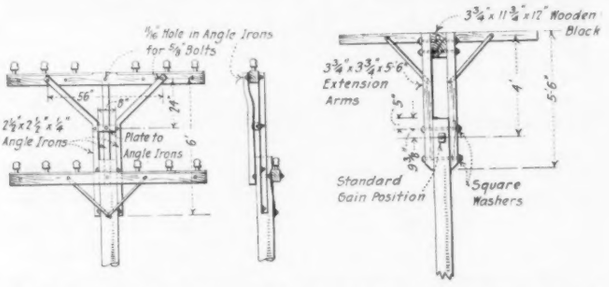



FIG. 2—STANDARD STEEL AND WOODEN POLE-TOP EXTENSIONS

The latter has the advantage of lower first cost and ease of installation. The steel extension is the stronger and is consequently used at corners and other points of strain, while the wood extension is used on all ordinary leads. It will be noted that the main braces on both types are slotted in order that the cross-arms may be leveled, even if the holes drilled through the pole are not exactly level.

A pole splice is a makeshift which when carelessly installed often leads to line failures and increased maintenance expenses. However, the use of these strong and standardized extensions has up to the present resulted in no failures, and it seems to be justified by the special requirements of the law.

## GUARDS UNDER CRANE CIRCUITS

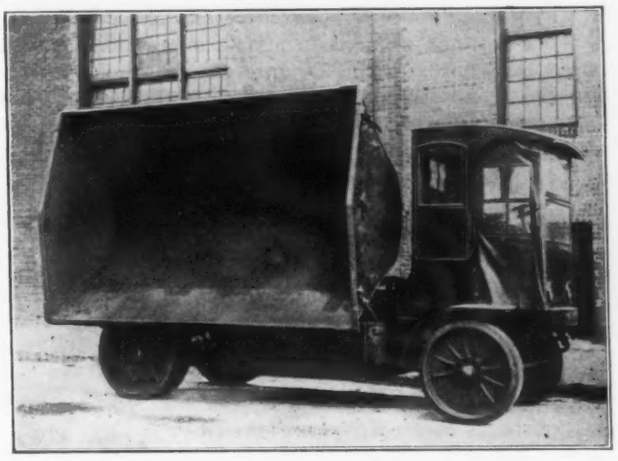
### Basket Guards Used to Protect 2300-Volt Bus from Falling Crane Trolley

One of the places in power houses which are commonly unguarded has been given careful consideration in the station of the Galesburg (Ill.) Railway, Lighting & Power Company. The bare conductors which furnish energy at low potential for operating the overhead crane are carried along the wall over the switchboard. If one of the conductors were to fall it would probably strike across the buses which are installed between the switchboard panels and the wall. To obviate the possibility of such an accident a basket guard somewhat similar in construction to those used on pole lines in the earlier days of high-tension construction has been placed beneath the crane circuit. The slight expense incurred in constructing the basket is believed to be entirely justified, since it removes any chance of accident from this source.

## HANDLING COAL WITH AN ELECTRIC TRUCK

### Cost of Hauling Coal with Self-Dumping Truck—Description of Truck and Data on Its Operation

Since the first of this year the Canton (Ill.) Gas & Electric Company has been hauling coal to its electric and gas plants in an electric truck. While complete cost data on the operation of the truck have not yet been obtained, the results, according to E. H. Negley, secretary and manager of the company, indicate that the investment was a good one and that a considerable saving in coal-hauling costs is being made.



ELECTRIC TRUCK EQUIPPED WITH NEW TYPE OF BODY FOR COAL HAULING

The haul from the railroad tracks to the company's electric plant is about three blocks long and to its gas plant about 1.5 miles (2.4 km.). Over this distance this truck makes a round trip to the electric plant in about seven minutes and can convey the contents of a 50-ton (45.5-t.) car of screenings to the station in about three hours. The round-trip haul to the gas plant requires about thirty minutes.

DATA ON OPERATION OF COAL-HAULING TRUCK FOR TWO WEEKS

| Date | Time, Hours Out | Number of Stops | Miles | Road Conditions | Ampere Hours | |
|---|---|---|---|---|---|---|
| | | | | | Total Used | Per Mile |
| Jan. 22 | 9 | 36 | 15 | Good | 180 | 12.0 |
| 23 | 9 | 38 | 22 | Good | 228 | 10.4 |
| 24 | 9 | 38 | 21 | Good | 222 | 10.6 |
| 25 | 9 | 36 | 28 | Good | 276 | 9.8 |
| 26 | 10 | 42 | 30 | Good | 300 | 10.0 |
| 27 | 9 | 26 | 19 | Good | 168 | 9.0 |
| | | Total | 135 | | Average | 10.3 |
| 29 | 9 | 12 | 13 | Mud | 180 | 12.0 |
| 30 | 10 | 18 | 26 | Mud | 444 | 16.0 |
| 31 | 9 | 22 | 16 | Mud | 340 | 20.0 |
| Feb. 1 | 9 | 19 | 23 | Rough | 220 | 9.0 |
| 2 | 10 | 18 | 22 | Rough | 312 | 14.0 |
| 3 | 9 | 22 | 16 | Rough | 204 | 12 |
| 4 | 5 | 10 | 6 | Snow | 96 | 16 |
| | | Total | 122 | | Average | 14 |

The speed of the truck loaded is about 7 miles (11.3 km.) an hour, and in ordinary operation it will cover from 15 to 25 miles (24 km. to 40 km.) a day, depending on how many trips are made. The truck is a Walker Vehicle Company's design with forty-four cells of 31-plate Philadelphia storage batteries. It is said to be the first electric truck to be equipped with a Lee Loader Company's dump body, the construction of which is shown in the illustration. The dumping feature of this body has demonstrated its value at Canton, since the driver alone through the use of it can unload 10,000 lb. (4536 kg.) of coal into the hopper in two minutes. The driver, who operates this truck exclusively, is responsible for its entire care, both as to charging and maintenance.

## ANCHORAGES AND PROTECTION FOR UNDERGROUND MAINS

### Wood-Box Protection, Provision for Drainage and Type of Concrete Anchorage Used in Recent Practice

BY T. W. REYNOLDS

Methods of protecting underground steam return mains, disposing of ground water and anchoring the mains are indicated by the accompanying illustration. A trench 18 in. (45.7 cm.) wide is dug and the pipe buried approximately 4 ft. (1.21 m.) below the surface. The pipe is supported on 2-in. by 4-in. (5.08-cm. by 10.16-cm.) cradles placed 4 ft. (1.21 m.) apart and inclosed by wood boxing, the sides of which are made of 1-in. by 10-in. (2.54-cm. by 25.4-cm.) boards and the top and bottom of 1-in. by 12-in. (2.54-cm. by 30.4-cm.) boards, two being used at the top. Sub-surface drainage is essential since water will collect and flow along the trenches even when they are back-filled. If it enters the boxing it will rot the wood, cause excessive condensation of the steam vapors in the return main and lower the temperature of the return water. Where steam-pipe covering is used it may be rapidly destroyed by water flowing along the outside of the pipe and the insulation properties of the covering reduced by the latter sagging away from the pipe. When the fill is composed largely of cinders, ashes will wash along the bottom of the box and by collecting at the pipe supports will cause rapid deterioration at the point of contact.

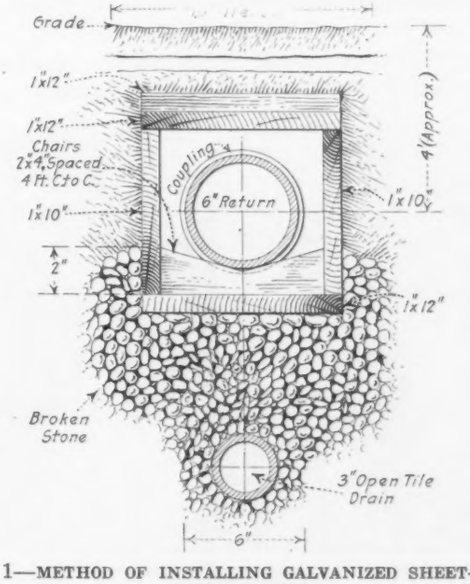



FIG. 1—METHOD OF INSTALLING GALVANIZED SHEET-IRON WATER SHIELD

As a partial preventive, a water shield of No. 22

U.S.G. galvanized sheet iron (commercial) may be bent over the pipe in the form of an inverted U with the edges resting on the bottom of the box next to the sides. As a further remedy broken stone may be laid across the trench from the bottom of the return main down to the base of the tile drain. The minimum distance between centers of return main and drain should be about 15

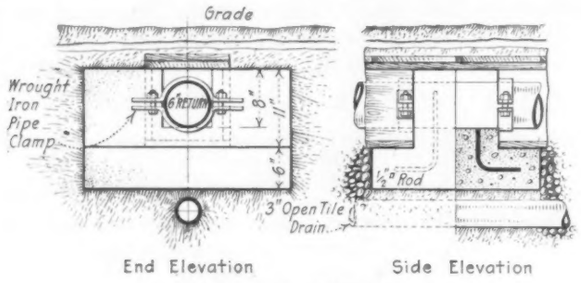


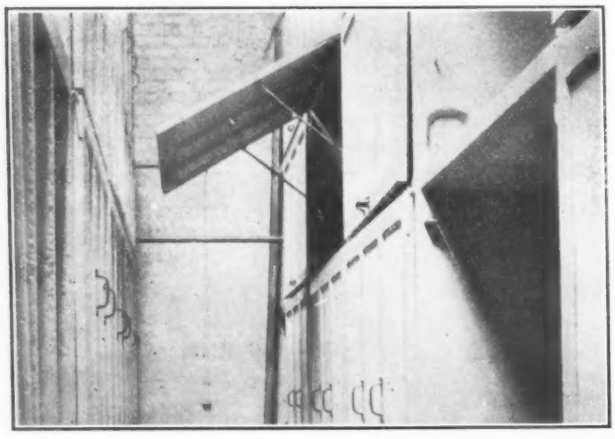

FIG. 2—DETAILS OF CONCRETE ANCHOR

in. (0.38 m.). Three-inch (7.62-cm.) tile drain can be used, being laid with open joints for the entrance of ground water which it conducts to the sewer. The concrete anchorages have 24-in. by 30-in. (0.6-m. by 0.75-m.) bases and are about 12 in. (0.3 m.) high. Through the top is a 7-in. by 8-in. (17.7-mm. by 20.3-mm.) opening for the passage of the pipe. Reinforcement with bent 4½-in. (11.3-cm.) square rods can be provided if desired. The boxing is omitted around the anchorages and wrought-iron pipe clamps are tightly bolted to the pipe, leaving a space between the upper and lower straps.

## METHOD OF SUPPORTING SWITCH-CELL DOORS

### Hangers Along Upper Edge of Door Engage with Hooks in Concrete—Braces for Holding Doors Open

For switch-cell construction on all voltages up to 11,000 the Pacific Gas & Electric Company has adopted



CELL DOOR BRACED OPEN

a door that embodies several features of convenience and economy. The panels consist of ¼-in. (6.4-mm.) asbestos on a wood frame, the dimensions of the units ranging up to a maximum width of 4 ft. (1.2 m.) and a height of 5 ft. (1.5 m.).

The doors are swung from the top and the smaller sizes are provided with brackets so that they can be braced open to afford convenient access. Instead of hinge supports, at the top of the doors there are hangers or projections made of ¼-in. (6.4-mm.) rods which engage with hooks embedded in the concrete. By lifting the door it may be entirely detached from the wall.

## PRACTICAL FORMULA FOR SHUNT-FIELD COILS

### Values That Will Be Found Sufficiently Exact When Only Approximate Calculations Are to Be Made

According to the London *Electrical Review*, the following formula reduced to simple expressions may be used for approximating readily the length of wire in or the ohmic resistance, current or ampere-turns of shunt-field coils:

$$\text{Length (ft.) of wire in coil} = A \times T \times L_k,$$
$$\text{Resistance (ohms, cold)} = A \times T \times R_k,$$
$$\text{Current (amp.)} = V \times C_k/AT,$$
$$\text{Ampere-turns} = V \times CT_k/T,$$

when

$A$ = area of winding space around magnet pole in square inches,

$T$ = length of mean turn in inches,

$V$ = volts across coil, and

$L_k$, $R_k$, $C_k$ and $CT_k$ are constants.

Constants may easily be worked out for any size of wire; values for Nos. 10 to 26 gage wires are given in the table below:

| Wire Gage No. | Dia. D.C.C. | $L_k$ | $R_k$ | $C_k$ | $CT_k$ |
|---|---|---|---|---|---|
| 10 | 0.14 | 4.25 | 0.00266 | 378 | 19,100 |
| 11 | 0.128 | 5.10 | 0.0039 | 260 | 15,650 |
| 12 | 0.116 | 6.2 | 0.0059 | 170 | 12,600 |
| 13 | 0.104 | 7.7 | 0.0093 | 108 | 9,850 |
| 14 | 0.090 | 10.3 | 0.0166 | 60.5 | 7,450 |
| 15 | 0.082 | 12.4 | 0.0247 | 40.7 | 6,040 |
| 16 | 0.074 | 15.2 | 0.0380 | 26.3 | 4,775 |
| 17 | 0.066 | 19.2 | 0.0630 | 15.9 | 3,650 |
| 18 | 0.058 | 24.70 | 0.110 | 9.1 | 2,680 |
| 19 | 0.050 | 33.30 | 0.212 | 4.72 | 1,860 |
| 20 | 0.042 | 47.2 | 0.375 | 2.675 | 1,510 |
| 21 | 0.038 | 57.5 | 0.58 | 1.72 | 1,190 |
| 22 | 0.034 | 72.0 | 0.945 | 1.06 | 913 |
| 23 | 0.030 | 92.5 | 1.65 | 0.605 | 670 |
| 24 | 0.028 | 106 | 2.26 | 0.442 | 563 |
| 25 | 0.026 | 123 | 3.175 | 0.315 | 465 |
| 26 | 0.024 | 144 | 4.6 | 0.217 | 376 |

The constants given were calculated on the slide rule and are not given as absolute values; they are, however, sufficiently close.

## TONING LIGHT FROM ARC LAMPS OF HIGH INTENSITY

### Shellac-Coated Globes Are Found to Be More Effective than Painted or Amber-Colored Globes for This Purpose

In attempting to produce a "Golden Way" by utilizing the regular street-lighting equipment the Union Electric Light & Power Company, St. Louis, Mo., encountered difficulty in coloring the globes of the high-intensity arc lamps used on the streets. Ordinary amber lamp coloring was too thin to have any effect. An attempt to use the amber coloring over a dense white failed because the white paint cracked and allowed the light to filter through the cracks. As a last resort the globes were coated with ordinary shellac, and this produced a very effective amber tone in the lighting.

# CENTRAL STATION SERVICE

*A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat*

## METHOD FOR HANDLING DELINQUENT ACCOUNTS

### Follow-up System Devised for Use by Properties Operating in Communities of Small Size in the East

A follow-up system for handling delinquent accounts is now in use by the Coast Division of the Lakewood & Coast Electric Company, Point Pleasant, N. J., and by the Commonwealth Electric Company, Summit, N. J., an affiliated company, both of which operate in small New Jersey towns. The system has met with considerable success, and by means of it delinquencies are kept down to a minimum.

The system is made up of four forms, here reproduced. No. 1 is on a 6-in. by 3-in. (15.24-cm. by 7.62-cm.) white slip of paper and simply calls the customer's attention to the fact that he is one month in arrears. The following month form No. 2, which is on a 6-in. by 3⅜-in. (15.24-cm. by 8.25-cm.) yellow slip, is sent out, calling attention to the fact that the account is sixty days in arrears and that two bills are now due. If by the tenth of the month the account is still unpaid, form No. 3, which is on a 6¼-in. by 8-in. (15.88-cm. by 20.32-cm.) light pink sheet, is mailed, calling the customer's attention to the fact that he now owes for three months and that unless the account is paid by the fifteenth service will be discontinued. On the tenth, the account still being unpaid, form No. 4, which is on a 6¼-in. by 7½-in. (15.88-cm. by 19.68-cm.) dark pink sheet, states that the disconnection

Form P2201-7-5-17-1M-L.

**Lakewood and Coast Electric Company**
Coast Division
ARNOLD AVENUE, POINT PLEASANT, N. J.

We beg to advise you that up to this time we have not received remittance covering your previous account. The matter, no doubt, has escaped your attention, but as bills are due when rendered, we trust you will not take offense at our calling the matter to your attention.

Respectfully yours,
LAKEWOOD AND COAST ELECTRIC COMPANY
COAST DIVISION

Electric Service No.....
Auditor's Dept. 1st.

DELINQUENT FORM NO. 1

Form P2202-7-5-17-1M-L.

**Lakewood and Coast Electric Company**
Coast Division
ARNOLD AVENUE, POINT PLEASANT, N. J.

We regret to note that your account is now sixty days in arrears as your two previous months' bills, as well as the enclosed bill, are now due. In justice to ourselves and to our other customers, we must ask that you give this matter your early attention. Unless a satisfactory payment is made within the next five days we cannot feel justified in continuing the service. We have endeavored to furnish you a satisfactory service at a reasonable price. We believe we have done our part, won't you do yours?

Respectfully yours,
LAKEWOOD AND COAST ELECTRIC COMPANY
COAST DIVISION

Electric Service No.....
Credit Dept. 2nd.

DELINQUENT FORM NO. 2

Form P-2203-7-7-17-L-1000

**Lakewood & Coast Electric Co.**
Coast Division
ARNOLD AVENUE, POINT PLEASANT, N. J.

Mr._____

We regret to find that your outstanding account now covers a period of three months, and as we have twice called the matter to your attention, we feel that you cannot be unaware of this fact, and as stated in our previous notice, we do not feel justified in longer continuing the service without payment.

We are therefore obliged to notify you that unless payment is received on or before the_____, we shall be obliged to discontinue the service.

Regretting that this action is necessary, we beg to remain,

Respectfully yours,
LAKEWOOD & COAST ELECTRIC CO.

Electric Service No._____
Total amount due on_____, $_____
Collection Dept. Final.

DELINQUENT FORM NO. 3

Form P 2204-10-16-16-500-L.

**Lakewood and Coast Electric Company**
Coast Division
ARNOLD AVENUE, POINT PLEASANT, N. J.

Mr._____

We beg to advise you that in accordance with the notice sent you on the 5th inst., we have this day instructed our Disconnection Department to disconnect the service to_____
on or before 5 P. M. of the_____

We so advise you in order that you may not be inconvenienced more than necessary. We sincerely regret that this step has to be taken, but we believe it necessary for the proper conduct of our business.

Respectfully yours,
LAKEWOOD AND COAST ELECTRIC COMPANY
COAST DIVISION

Amount Due 1st inst., $_____
Electric Service No._____

Office Check
No payment received up to
_____ A. M.
_____ P. M.
Date_____
Checked by_____

DELINQUENT FORM NO. 4

department has been notified to disconnect service on or before 5 p. m. of the fifteenth. This form is checked by the local superintendent. On the fifteenth an employee is sent out with instructions to collect or disconnect.

Very seldom, it is stated, does it become necessary to send out form No. 4 or even No. 3. It is generally understood that the companies mean what they say, and for that reason reminders such as No. 1 or No. 2 are generally sufficient.

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## HOW MUCH IS THE "ELECTRIC" WORTH TO A COMMUNITY?

### What the Sale of Passenger Cars and Trucks Means in Dollars and Cents to Sales Agent, Central Station and Electrical Contractor

Peoria, Ill., is a hilly city with a population of 100,000. Topographically considered, it is not by any means an ideal place in which to promote electric vehicle sales. Nevertheless, some 300 electric passenger cars and a few commercial electric vehicles are driven daily on its streets. Figured on a per capita basis this showing compares quite favorably, not only with the country at large but with the figures for cities like Chicago.

A study of why the electric car is so popular at Peoria brought out several interesting facts, three of which seem more important than the others. First, the successful distributers have been electric car distributers; they have left the gasoline car strictly alone, not only commercially but actually. And while at the present time the chief agency firm in the city does a combination electric and gas car business, one member of the firm, who has been always an electric car man, devotes his entire time to the electric cars and never rides in a gas car. He believes in the electric absolutely, and he does not hesitate to say so. Counting sales of used cars as well as new cars, this man alone has sold 225 cars since he has been in the business at Peoria. He believes that it pays well to specialize on selling the electric.

The second great factor in electric vehicle success is the central station's attitude. The Central Illinois Light Company has tried to lend a hand in promoting vehicle business, but it has tried to do this without entirely subsidizing the sales agencies. Its vehicle promotion program has been about as follows: For private garages it established a 5-cent net rate; for commercial charging a power schedule sliding from 9 cents to 2 cents was used, and this gave a rate averaging less than 2.75 cents per kilowatt-hour. The company's co-operative sales effort consists in running a display advertisement on vehicles weekly in the Sunday papers and in using trucks for some company business.

The third important factor contributing to the success of the electric car at Peoria involves the general local situation. There are many people in the city who can and do afford two cars—an electric and a gasoline car. Moreover, Peoria is not in a location favorable to touring. When once a car leaves the paved streets it encounters roads so nearly impassable to any car that the joy of motoring turns into marked discomfort. This fact, of course, makes the electric almost as nearly 100 per cent usable as the gas car. It is an instance wherein bad roads help the sale of electric vehicles.

In addition to these three chief reasons, other causes, including a favorable garaging situation, undoubtedly have contributed to success. There are three large public electric garages, although about 60 per cent of the pleasure cars are kept and charged at home by owners. The fact that electric cars were made fashionable by sales to prominent families in the early days of the business may have helped popularize the electric.

While there is some difficulty in definitely determining the reason why electric cars should be popular in some cities and at the same time fail to gain in others, it is comparatively easy to show that as income producers electric cars are worth while popularizing. The local sources to which revenue flows from the sale and operation of these vehicles are the sales agencies, the central stations, the electrical contractors and the electric

THE PRIVATE ELECTRIC GARAGE IS GETTING TO BE A FACTOR IN HOME BUILDING AT PEORIA, ILL.

garages. The sales agencies at Peoria have disposed of 300 new cars in seven years of gradual growth. Many of these have been sold more than once as used cars, and hence have been more than once sources of revenue to the sales agencies. But, disregarding the revenue on used-car sales, it will be seen that 300 cars, at an average price of more than $2,000, means gross sales of more than $600,000 in seven years. The comfortable commissions on this amount must be regarded as income to the local section of the electrical industry. In addition to this, the car agencies have sold the majority of the charging sets for private garages. The retail price of this equipment in the aggregate would be about $35,000. About sixty new cars have been sold in Peoria since Jan. 1, 1917.

The income to the central station can be determined even more definitely. There are in the city 179 private garages with charging apparatus. The average annual energy used per customer has been found to be 1250 kw.-hr.; 179 garages would therefore use approximately 223,740 kw.-hr. At the average rate of 5.03 cents per kilowatt-hour this would produce an income from privately garaged vehicles alone of $11,212.56. Similarly, garages for commercial vehicles return to the company about $1,800 a year. Public garages caring for both passenger cars and trucks pay annually, on a conservative estimate, more than $3,000 a year for energy. It will be seen, therefore, that the company derives upward of $16,000 annually from energy used for charging elec-

tric cars. The handling of this business requires the issuance of only between 1500 and 1800 monthly bills per year.

The electrical contractors find it difficult to say how much business the electric cars bring them. The more progressive business men among them admit that they bring some business in the shape of wiring jobs, but there is a general feeling among the contractors that they should sell the charging apparatus which is usually sold by the car agencies before others are aware that a prospective customer is in the market.

With the public garages business, of course, comes and goes; but on the average these concerns handle at all times at least 130 cars, which brings them a revenue of around $45,000 a year, exclusive of their business in repair parts and tires, which is a considerable item.

## CENTRAL STATION FOOD CONSERVATION SCHOOL

### Merchants' Heat & Light Company of Indianapolis Teaches Methods of Saving Food and of Operating Electrical Appliances in an Eight Weeks' Course

At the suggestion of Mrs. R. A. MacGregor, the Merchants' Heat & Light Company of Indianapolis, Ind., is offering an eight weeks' home economics course. There are five classes with twenty women to each class. The meetings are held between the hours of 10 and 11 each morning except Saturday and Sunday.

These classes are in charge of Mrs. W. J. Marks, who has had several years of experience in teaching domestic science. There is no financial consideration in connection with the lectures and demonstrations, the movement being arranged as an aid to the food conservation moment advocated by Herbert C. Hoover. The program for the eight weeks is as follows:

Week of July 9, conservation and planning meals; week of July 16, buying, food values, receipts and demonstration; week of July 23, canning, drying, receipts and demonstration; week of July 30, care of foods, substitutes, receipts and demonstration; week of Aug. 6, starches, cereals, vegetables, receipts and demonstration; week of Aug. 13, milk, eggs, cheese, receipts and demonstration; week of Aug. 20, meat selection and substitutes, results and demonstration, and week of Aug. 27, fats, utilization and deep frying, and receipts and demonstration. In all demonstrations electrical appliances and electric ranges are utilized.

## WATER-HEATER CAMPAIGN OF A WESTERN COMPANY

### Southern California Edison Sales Exceeded 100 Heaters in First Half of Current Year, as Result of Vigorous Effort

Although there has been considerable activity in electric range sales, the electric water heater has generally been believed to require more development work before it can be marketed successfully on a large scale. In view, therefore, of the existing situation, it is interesting to note that the Southern California Edison Company, Los Angeles, at the beginning of the current year started a vigorous campaign on water heaters and is meeting with considerable success.

In commenting on this campaign before a recent meeting of the company's employees, S. M. Kennedy, general agent of the company, said:

> Only eighteen months ago this company started selling electric ranges, after we had convinced ourselves that electric cooking was practical and that the electric range was an efficient appliance, and six months ago we commenced to sell electric water heaters in earnest.
>
> There are three or four entirely satisfactory water heaters on the market, doing excellent work and giving good service. The establishment of the combination schedule takes care of the water heating in a very satisfactory way after the electric range has been installed. We have on the Edison company's system to-day, either installed or to be installed, a total of 1750 electric ranges. All of these are prospective water-heater customers. I believe our water-heater sales in the last six months have exceeded 100. The water-heater consumption is about as large as that of a range, so when we sell a water heater in connection with a range it doubles the income for the company.

## ELECTRIC RANGE ENERGY CONSUMPTION DETAILS

### Average Figures for Families of Different Size Showing Energy Use per Person per Month in Canadian Town

Details on energy consumption for electric cooking have been compiled by the Hydro-Electric Power Commission of Ontario for a number of the municipalities served. Averages from the municipality of London are shown in the accompanying table. Here the figures give the averages per family for families of the same size. It is interesting to note that for families of one the average energy consumption per person is 90 kw.-hr., while for families of ten the average is 29 kw.-hr.

DETAILS OF AVERAGE CONSUMPTION OF ELECTRIC RANGES

| Average No. of Consumers | Average Size of Family | Monthly Consumption, Kw.-Hr. | | | Floor Area Sq. Ft. | Monthly Bill | | | Range Capacity, Kw. | Consumption per Kw. of Range, Kw.-hr. | Cost of Installation | Range Kw.-Hr. per Month per Person | Range Cost per Month per Person |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Without Range | With Range | Of Range | | Without Range | With Range | For Range | | | | | |
| 2 | 1 | 38 | 128 | 90 | 1050 | $0.91 | $1.72 | $0.81 | 4.2 | 21.4 | 7.65* | 90 | $0.81 |
| 49 | 2 | 32 | 151 | 119 | 1270 | 0.88 | 2.03 | 1.15 | 5.13 | 23.2 | 17.04† | 60 | 0.58 |
| 66 | 3 | 34 | 171 | 137 | 1620 | 0.99 | 2.33 | 1.34 | 5.35 | 25.6 | 17.71‡ | 46 | 0.45 |
| 53 | 4 | 39 | 212 | 173 | 1770 | 1.15 | 2.87 | 1.72 | 5.97 | 29.0 | 21.00¶ | 43 | 0.43 |
| 38 | 5 | 37 | 205 | 168 | 1780 | 1.13 | 2.82 | 1.69 | 5.5 | 37.3 | 16.82§ | 34 | 0.34 |
| 22 | 6 | 41 | 242 | 201 | 1830 | 1.20 | 3.16 | 1.96 | 6.15 | 33.7 | 19.10 | 34 | 0.33 |
| 11 | 7 | 68 | 274 | 206 | 2050 | 1.58 | 3.58 | 2.00 | 5.0 | 41.2 | 21.83** | 29 | 0.29 |
| 6 | 8 | 53 | 275 | 222 | 2050 | 1.46 | 3.60 | 2.14 | 5.05 | 44.0 | 15.19†† | 28 | 0.27 |
| 5 | 9 | 36 | 292 | 256 | 1480 | 1.09 | 3.47 | 2.38 | 6.5 | 39.4 | 15.87 | 28 | 0.26 |
| 2 | 10 | 144 | 536 | 292 | 2650 | 2.72 | 6.26 | 3.54 | 6.5 | 60.7 | 23.20 | 29 | 0.35 |

RATES.—3 cents per month per 100 sq. ft. of floor area, plus 2 cents per kw.-hr. for the first 3 kw.-hr. per month, per 100 sq. ft. of floor area billed, plus 1 cent per kw.-hr. for all remaining consumption. Discount of 10 per cent for prompt payment.

*One consumer. †Average for 35 installations. ‡Average for 42 installations. ¶Average for 38 installations. §Average for 29 instal ations. **Average for eight installations. ††Average for three installations.

# ADVANCE IN TECHNICAL THEORY AND PRACTICE

*Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World*

## ERRORS OF REGISTRATION OF ELECTRICITY METERS

### An Investigation of the Irregularities Caused in Ampere-Hour Meters by Varying Loads—Effect of Fluid Friction

THE errors of registration of electricity meters over periods during which there is a variation of the current passing are a matter of considerable interest, says G. W. Stubbings in the London *Electrical Review* for July 6, 1917. The article takes into consideration ampere-hour meters only, and variations of voltage have not therefore to be taken into account. The performance of a theoretically accurate meter with varying currents has been previously investigated, and it is now well known that such a meter with eddy-current braking, whether shunted or not, correctly records the total quantity of electricity, notwithstanding any variation of the current. The case of a meter of the commutator type may first be considered. With such a meter the error is due to an approximately constant frictional torque, and the percentage error curve is of the form $\eta = K - n/C$, $\eta$ being the percentage error, $n$ a constant depending on the frictional torque, $K$ the percentage difference between the correct and ideal speeds of the meter, and $C$ the current passing. Since the meter is inaccurate, the speed of the meter rotor will correspond to an inaccurate value of the current, which will be:

$$C_m = C(1 + K/100 - n/100C),$$
$$= C + KC/100 - n/100.$$

This expression refers to instantaneous values of the current, which may be any function of the time. The quantity recorded by the meter will therefore be obtained by integrating the expression between the limits 0 and $t'$, $t'$ being the time during which current has been passing.

$$\int_o^{t'} C_m dt = Q + KQ/100 - nt'/100,$$

$Q$ being the correct quantity. The percentage error will accordingly be $K - n/C_a$, $C_a$ being the average current over the period $t'$. It therefore follows that in the case of a meter with an error curve of the form given, the error of registration over a period will be the error at the average current over the same period, whatever be the nature of the variation of the current. The case of a meter having fluid as well as solid friction is also considered. With such a meter the error curve will be of the form $\eta = K - n/C - mC$, $m$ being a constant depending upon the magnitude of uncompensated fluid friction. We have therefore:

$$C_m = C + KC/100 - n/100 - mC^2/100,$$

$$\int_o^{t'} C_m dt = Q + KQ/100 - nt/100 - (m/100)\int_o^{t'} C^2 dt,$$

the percentage error being $K - n/C_a - (m/Q)\int_o^{t'} C^2 dt$.

The portion of the error due to fluid friction is therefore proportional to the ratio of the mean square of the current to the average value of the same, and such value of the fluid friction error will thus always be higher than that at the average load. In the case of most house-service meters not only is the compensation for fluid friction fairly complete, but the effect of such friction is at the usual loads very small; the value of $K$ is also, owing to the different shape of the error curve, higher than in the case of a meter with solid friction only. It is therefore legitimate to assume that the accuracy of a house-service mercury meter over extended periods will be equal to that of a commutator meter under similar conditions, the circumstance of variation of current only being taken into account. The effect of fluid friction with meters of higher capacities will become more important with varying loads, the magnitude depending upon the nature of the variation. With a load corresponding to $C = C_a(1 + a \sin pt)$, the ratio of the mean square to the mean current will be $C_a(1 + \frac{1}{2}a^2)$, and the effect of fluid friction is sensibly increased.

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### Generators, Motors and Transformers

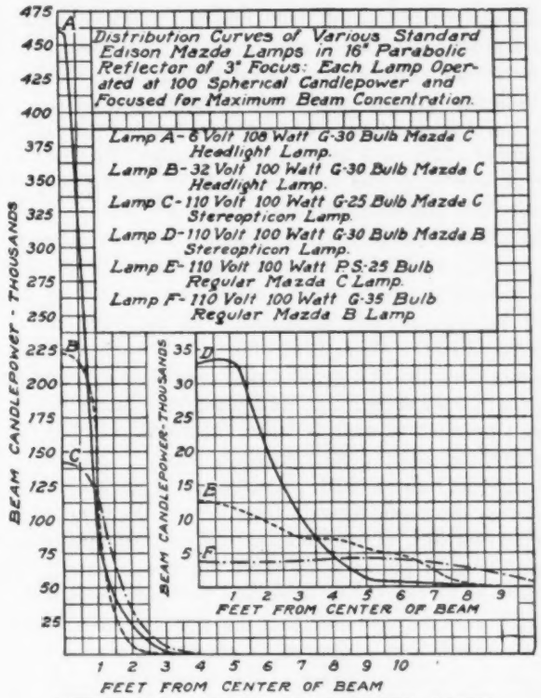
*Bell Transformers.* — E. Wirz. — Transformers for operating bells and similar auxiliary services in houses are discussed in detail. Reference is made to design, losses in operation, load and voltage drop, temperature rise, insulation, cost of operation and tariffs. In the cost of operation a comparison is made between transformers and batteries.—London *Electrician*, July 6, 1917.

### Lamps and Lighting

*Luminous Radiation from a Black Body and the Mechanical Equivalent of Light.*—W. W. Coblentz and W. B. Emerson.—This paper gives some applications of the curve of visibility of radiation for the average eye (125 observers) to radiation problems. A mathematical equation is given of the average visibility curve. Using this visibility equation and Planck's equation of the black body, calculations are made of the luminous flux emitted by a black body at various temperatures, also the luminous efficiency, the Crova wave length, and the mechanical equivalent of light. The visibility curve of the average eye gives a value for the least mechanical equivalent of 1 lumen = 0.001627 watt of luminous flux of maximum luminous efficiency. The two determinations of the least mechanical equivalent of light made by Ives, Coblentz and Kingsbury are corrected. The values obtained by their two methods of measurement, using sixty-one observers, are in exact agreement, giving 1 lumen = 0.001606 watt. A further determination of the least mechanical equivalent of light was made by using a standardized vacuum tungsten lamp as a source of radiation. The measurements on this lamp gage a

value of 1 lumen = 0.00157 watt of radiant energy of maximum visibility. These computations are based upon the most probable values of the radiation constants: $C_2$ = 14,350 micron deg. and $\sigma = 5.7 \times 10^{-12}$ watt per cm² per deg.[4] On this basis the most reliable data now available indicate that the value of the luminous equivalent of radiation of maximum luminous efficiency is of the order of: 1 watt = 617 lumens = 49.1 candles; 1 lumen = 0.00162 watt of luminous flux. Among other data this paper gives the determination of the radiant luminous efficiency of a vacuum tungsten lamp, the value being 1.42 per cent when operated at 1.23 watts per candle.—*Scientific Paper No.* 305, Bureau of Standards.

*Floodlighting.*—L. C. PORTER.—Some applications of floodlighting are enumerated and the principles of projection reviewed in this paper. Emphasis is placed on the importance of accurate focusing when using any form of projector. In one case to which the author


Distribution Curves of Various Standard Edison Mazda Lamps in 16" Parabolic Reflector of 3" Focus: Each Lamp Operated at 100 Spherical Candlepower and Focused for Maximum Beam Concentration.
Lamp A- 6 Volt 108 Watt G-30 Bulb Mazda C Headlight Lamp.
Lamp B- 32 Volt 100 Watt G-30 Bulb Mazda C Headlight Lamp.
Lamp C- 110 Volt 100 Watt G-25 Bulb Mazda C Stereopticon Lamp.
Lamp D- 110 Volt 100 Watt G-30 Bulb Mazda B Stereopticon Lamp.
Lamp E- 110 Volt 100 Watt P.S.-25 Bulb Regular Mazda C Lamp.
Lamp F- 110 Volt 100 Watt G-35 Bulb Regular Mazda B Lamp
BEAM CANDLEPOWER - THOUSANDS
FEET FROM CENTER OF BEAM
BEAM CANDLEPOWER - THOUSANDS
FEET FROM CENTER OF BEAM
DISTRIBUTION CURVES OF TUNGSTEN LAMPS

refers the beam candlepower was reduced from 220,000 cp. to 8000 cp. by moving the light source ¼ in. (64 mm.) back of the focus. Moving the filament an equal distance to one side of the focus threw the beam 4 ft. (1.2 m.) to one side at a distance of 100 ft. (30.5 m.) from the projector and reduced the beam candlepower from 220,000 cp. to 125,000 cp. The beam candlepower was also considerably affected by the magnitude of the light source, as shown by the accompanying curves. The intensity of illumination and voltage required depends on local conditions. If the surface to be lighted is very light in color and seen against a dark background, it may be practicable to use as low as ¼ watt per square foot (0.1 sq. m.) of surface lighted. Red brick requires at least 2 watts per square foot (0.1 sq. m.), while dark red, dark green and bronze surfaces may require as high as 5 watts per square foot (0.1 sq. m.). Ample allowance should be made for depreciation of the light equipment.—*Transactions* of Ill. Eng. Soc., June 11, 1917.

## Installations, Systems and Appliances

*Fuel Economy.*—J. A. ROBERTSON.—A paper read before the convention of the Incorporated Municipal Electrical Association. The author points out the necessity for fully utilizing the national resources to meet the economic conditions arising out of the war, which has made the question of fuel economy one of urgent and vital importance. The author presents diagrams and figures showing that the output of coal per annum per person employed in mining is diminishing in England and the cost is rising, whereas the converse is the case in the United States. The paper discusses the possibility of economizing fuel by centralizing the production of power and by combining the carbonization of coal and by-product recovery with the generation of electricity.—London *Electrician*, June 22, 1917.

## Electrophysics and Magnetism

*Electrical Resistivities of Iron Alloys.*—T. S. FULLER.—Characteristics of iron alloys the resistivities of which are greater than those of the components. Data are given on iron-nickel, iron-chromium, iron-cobalt, iron-nickel-chromium, iron-nickel manganese and iron-nickel-chromium-manganese alloys.—*General Elec. Review*, July, 1917.

*Permanent Magnets.*—F. C. KELLEY.—Résumé of work done by the principal investigators along this line. The effect of chemical composition, shape and dimensions, heat treatment and usage on the strength and permanence of magnets is reviewed in detail.—*General Elec. Review*, July, 1917.

## Electrochemistry and Batteries

*New Steel Alloy, Cobaltcrom.*—This alloy, discovered by Darwin and Milner of Sheffield, England, is the addition of cobalt to chromium-carbon steel, converting a steel which had no appreciable red cutting hardness into one which had the very valuable qualification. It is pointed out that the cutting efficiency of this new steel is quite equal, even in the form of castings, to that of tools made from the forged or rolled bar in which high-speed steel is supplied commercially.—London *Engineering*, July 6, 1917.

*An Investigation of Radium Luminous Compound.*—C. C. PATERSON, J. W. T. WALSH and W. F. HIGGINS.—The paper contains the results of measurements made on various samples of radium luminous compound during the last two years. Determinations of the brightness of the compound in powder form and when made up into paint, and also after the application of the paint to instrument dials, were carried out, and curves are given showing the rates of decay of luminosity. The radium contents of the compounds were determined by comparison of their X-ray activities with that of a preparation of pure radium bromide, which is periodically compared with the British radium standard. The various precautions which have to be observed and the corrections which have to be applied in making the various determinations are explained.—London *Engineering*, June 22, 1917.

## Units, Measurements and Instruments

*The Resistance of the Motion of a Lamina, Cylinder or Sphere in a Rarefied Gas.*—F. J. W. WHIPPLE.—In this paper the investigation is carried out on the assumptions that the free paths of the particles of the gas are long compared with the dimensions of the mov-

ing body, and that the motion, relative to the body, of the particles which rebound from it depends only on its temperature. It is shown that if $v$, $w$ be the components of velocity perpendicular to the surface of a lamina and parallel thereto, the corresponding components of the resistance are

$$(4+\pi)\sqrt{\frac{3}{2\pi}}\frac{v}{V}p \text{ and } 2\sqrt{\frac{3}{2\pi}}\frac{w}{V}p,$$

where $V$ is the standard (root-mean-square) speed of the gas particles and $p$ is the gas pressure. The resistance to the motion of a cylinder or a sphere is found to differ very slightly from the resistance to a lamina occupying the central section. The formula are applicable to the problem of the damping of the oscillations of a system suspended in a rarefied gas.—London *Engineering*, June 22, 1917.

### Miscellaneous

*Effect of War on the Development of Water Power.*—Strange as the affirmation may seem, without the war and the needs that it has created, many waterfalls in the French Alps that have been put into service would probably have waited long for their complete utilization. The needs of national defense have put some of these into use for the first time and have caused a resumption of work on many others where it had been suspended at the time of mobilization. In spite of the great obstacles that had to be overcome, power houses are in course of construction that will have a total rating of 40,000 hp. and will afford to the industries of the region an additional 20,000 hp. in winter and 25,000 hp. in summer. Besides this, water from some of the highest falls is to be used directly by apparatus operating under static pressure at 50 or 60 atmospheres in a manner both ingenious and extremely important. Electrometallurgical and electrochemical processes have also been greatly stimulated by the hydroelectric developments of the war. If, with the return of peace, the possibilities of the French Alpine water powers are carried to their highest possible development, at least 15,000,000,000 kw.-hr. a year can be produced.—Extracted from M. de la Brosse's "Compte Rendu du Service des Grandes Forces Hydrauliques," in *L'Industrie Elec.*, June 10, 1917.

*International Society of Electricians.*—The annual convention of this society was held in Paris on April 5 concurrently with the regular monthly session. A congratulatory motion on the entrance of the United States in the war was cabled to the American Institute of Electrical Engineers. Among the papers contributed to the society in the year preceding the meeting, the report of the committee of administration made mention of one by M. Kiovici containing a theoretical and experimental study of transformers, one by D. Berthelot which provoked much discussion, on the reciprocal relations of electrical and magnetic phenomena, universal gravitation, the principle of relativity and the discontinued elementary factors of energy, and one by M. de la Gorce containing a description of the apparatus employed at the Central Electric Laboratory for the testing of transformers. Mention was also made of the report presented by R. V. Picou, chairman of a joint committee of the society and the Union of Electrical Syndicates, on the unification of line insulators, the report having been adopted by the two organizations.—*Bulletin de la Soc. Internat. des Elec.*, April, 1917.

## Book Review

ELECTRIC TRACTION: A Treatise on the Application of Electric Power to Tramways and Railways. By A. T. Dover. New York: The Macmillan Company, 667 pages, 518 illustrations. Price, $5.50.

The author of this book is a lecturer on electric traction at the Battersea Polytechnic, London, and the text is about what one would expect to find in a comprehensive course of lectures on electric traction. The style is appropriate to such a lecture course. In preparing the material for a wider audience Mr. Dover had in mind that the book would be useful to engineers as well as to advanced students. A considerable number of the illustrations of present practice are naturally drawn from that of Great Britain and the Continent, but American railways have by no means been neglected. The fundamental principles are, of course, applicable everywhere. The author has treated the main subject with the following topics as subdivisions: Mechanics of train movement; motors; control; auxiliary apparatus; rolling stock; detailed study of train movement; track and overhead construction, and distributing systems and substations. He has not tried to cover generating stations and transmission lines. If one keeps in mind that the text is addressed to a circle of readers familiar in a general way with the fundamentals of mechanics, electric circuits and engineering principles, who desire information on the peculiar problems of electric traction and the way in which these problems have been solved, he will have a pretty good notion of the kind of book which Mr. Dover has produced. In carrying out his aim, particularly with reference to students, he has naturally brought in a great many examples to show how the principles are applied, and along the same line has added a number of examination questions selected from those of four leading British institutions. The book is profusely illustrated with pictures and diagrams, covers direct-current and alternating-current railways, contains a great deal of comment as well as descriptive matter, and should prove a valuable reference work. The publication of this book suggests that the engineering world is indebted to the teaching profession for many treatises which are prepared as accompaniments to lecture or recitation courses. The preparation of such courses naturally leads to comprehensive study of the respective fields covered by them, and this in turn suggests publication, where the subjects are not yet adequately covered. In the present case one is inclined to wonder why another book in the field of electric traction was considered necessary at this time. It is true, however, that in many directions electric railway equipment is still developing rapidly and that a book in which existing practice is described soon becomes out of date.

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## Books Received

HOW TO STUDY. By George Fillmore Swain. New York: McGraw-Hill Book Company. 65 pages. 25 cents.

REPERTORIUM DER PHYSIK. By Rudolph H. Weber and Richard Gans. Leipzig and Berlin: B. G. Teubner. 614 pages, illustrated.

ELECTRICAL MEASUREMENTS IN PRACTICE. By F. Malcolm Farmer. New York: McGraw-Hill Book Company. 360 pages, 230 illustrations. Price, $4.

# NEWS OF THE INDUSTRY

*Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields*

## PRESIDENT GETS COAL COSTS AND PRODUCTION ANALYSIS

### Indications Point to Fixing of a Single Price for Government, Industries and Private Consumers

President Wilson has received from the Federal Trade Commission the analysis of costs of production and distribution of coal. This important information, for which the President has been waiting some time, will play a very material part in the policy which the government may pursue as to the relation between the government and private industry so far as the fixing of the price for coal and the price for other material in private industries is concerned. There have been rumors in Washington that certain important members of the Board of Coal Production and Distribution might resign from the positions they occupy in the Council of National Defense. Furthermore, it is reported that President Wilson might accept their resignations if offered.

Up to the time of going to press no information could be obtained at the White House as to what is to be done in regard to the price fixing of coal, but there is the clearest indication that if any one, no matter who he may be, attempts to get in the way of fixing the price of coal not only for the government but for private industry and the private consumer, President Wilson himself will make it clear that prices must be fixed with the assistance of the Attorney-General, to whom he has given instructions. There are certain indications at the White House, according to the report of the Washington correspondent of the ELECTRICAL WORLD, that the authorities intend to act favorably upon the recommendation of the Federal Trade Commission that one price shall be established not only for the government and for private industries but for the army of individual small private consumers of coal throughout the country as well.

#### COMMISSION ISSUES STATEMENT

A day or two prior to sending the report to the President the Federal Trade Commission authorized the following statement:

The report that will be sent to the President will be based on careful cost determination of wages, maintenance, overhead and material charges. Depreciation is carefully considered, as are investment and other factors.

The work entails careful study of many sets of books and inspection at the mines frequently of special factors bearing on costs. As the reports come to the commission the information is correlated and each report is carefully analyzed and checked up. All apparent exceptions are investigated. The result will be that when the report is sent to the President it will have been done with such complete thoroughness that a "fair and just" price can be determined on the basis of the cost determination. It is the cost determination only, not the price determination, that the commission is concerned with.

## NO HEAVY TAXES ON ELECTRICAL INDUSTRY

### President Known to Be in Favor of Equitable Distribution of Taxes on Industries and May Yet Take Personal Charge of This Work

Senator Simmons, chairman of the finance committee of the Senate, assured the Washington correspondent of the ELECTRICAL WORLD Wednesday night that no heavy taxes would be imposed upon the electrical industry so far as he knows. This alludes to the situation of the war revenue tax bill in the Senate.

Senator Simmons, while believing that there will be no bond issue and that the desired revenue from the proposed taxes will be otherwise obtained, thinks that nevertheless Secretary McAdoo may recommend a bond issue in order to take up some of these taxes. Newspapers have reported what are apparently the conclusions of the Senate finance committee, but it is understood in Washington that all these apparent conclusions are still subject for negotiation. An effort has been made by some of the newspapers to show that there will be certain conditions to the war revenue tax bill, especially in regard to the amount of increased tax on excess profits.

Most of these proposals, according to the information obtained from Senator Simmons, are subject to the work of the House ways and means committee, and Senator Simmons himself is frankly worried and anxious as to what the House committee may do. Mr. Kitchin, chairman of the House committee, saw President Wilson for a few minutes at the White House during the week. There is a general impression among members of the House of Representatives that he wishes to have all of the industries in the eastern part of the United States taxed.

It is understood that he received no encouragement in this point of view during his call at the White House. It may be stated upon the highest authority that President Wilson will insist that the taxes shall be distributed in an equitable manner.

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## NATIONAL DEFENSE COUNCIL AND ITS SUBSIDIARIES

### Congressional Jealousy Over the Powers Assumed by the Council May Lead to Difficulties—President Wilson to Support the Council

A legislative fight of extreme bitterness is in progress in Washington, under the surface, apparently, in regard to the National Defense Council, its advisory commission and its committees.

The fight is on the question of whether the members of the Council, the commission and the committees shall be allowed to continue to specify which firms and

companies have materials which are needed by the government for the conduct of the war and what prices ought to be paid. The process has been that the committees and the commission and the Council have recommended that the government obtain its supplies from certain firms and the prices which should be paid. These recommendations have been followed by the executive branch of the government. Senators and representatives in Congress believe that this is an improper way of supplying the government, and many of them purpose to put a stop to it if they can.

President Wilson has taken a hand in the controversy. He has written a letter to Senator McKellar, a member of the Senate committee on agriculture, which has charge of the so-called food bill, urging him to induce the Senate to drop from that bill the provision which would prohibit members of the Council, its commission and its committees from serving on those bodies while firms and companies with which they are connected are supplying the government.

That President Wilson intends to support the Council, its commission and its committees was indicated in Washington in the past week when he attended a joint meeting of these bodies in the office of the Secretary of War, the president of the Council.

The President is understood to have discussed the possibility of his issuing an executive order recognizing the advisory commission as an independent body, without waiting for Congress to pass the food bill. Such a course, in the President's belief, it is said, would give effectiveness to the conclusions of the body and would carry out the President's views of its valuable objects and potentialities. Such a course was pursued in the establishment by the President of the food administration body, which is now at work, although Congress has not passed the food bill.

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## MISCELLANEOUS EQUIPMENT FOR THE EMERGENCY FLEET

### Text of Specifications for Electric Wiring Materials for Ships Belonging to the National Merchant Fleet

Needs of the Emergency Fleet Corporation of the United States Shipping Board for certain miscellaneous electrical equipment are shown in detail in specification No. 127. The bids on this material will close about Aug. 5, 1917, the ELECTRICAL WORLD is advised. The text of the specification follows:

Each 3500-ton ship requires the following electric wiring materials, all of the commercial marine type, for a 120-volt, two-wire, direct-current installation:

Item 1.—108 deck fixtures, steam-tight or vapor-proof galvanized (or sherardized) iron or brass, with globe and switch, without guard, complete with all necessary fittings.

Item 2.—Thirty-seven bulkhead fixtures, steam-tight or vapor-proof, galvanized (or sherardized) iron or brass, with globe, switch and guard, complete with all necessary fittings.

Item 3.—One magazine fixture, same as Item 1, but with globe and guard and without switch.

Item 4.—Three 250-watt fixed units, non-water-tight, without switch, with porcelain-lined metal reflector and guard, complete with outlet box and all necessary fittings and accessories.

Item 5.—Ten 250-watt portable units, non-water-tight, with porcelain-lined metal reflector, guard and hooked handle, complete with socket and all necessary fittings and accessories, except that neither cord nor plug is required.

Item 6.—Five 500-watt portable units, otherwise same as Item 5.

Item 7.—Twelve desk lamps, non-water-tight, with switch and shade, without guard, complete with socket and all necessary fittings and accessories, except that neither cord nor plug is required.

Item 8.—Twenty 60-watt portable units, otherwise same as Item 5.

Item 9.—Two battle lanterns, non-water-tight, without switch, with guard, hooked handle and opaque shutter for darkening light, complete with socket and all necessary fittings and accessories, including both cord and plug.

Item 10.—One blinker light, water-tight, brass base, rigid construction, complete with socket and all necessary fittings and accessories, including both cord or cable and plug.

Item 11.—Two sidelights (port and starboard), combination oil and electric, water-tight, brass base, rigid construction, regulation size, complete with socket and all necessary fittings and accessories, including both cord and plug.

Item 12.—Two anchor lights (fore and aft), combination oil and electric, regulation size, and otherwise as per Item 11.

Item 13.—One range light, combination oil and electric, regulation size, and otherwise as per Item 11.

Item 14.—One stern light, combination oil and electric, and otherwise as per Item 11.

Item 15.—One masthead light, combination oil and electric, regulation size, and otherwise as per Item 11.

Item 16.—One 50-amp. snap switch, double-pole, in steam-tight iron or brass box, complete with all fittings and accessories.

Item 17.—Ten 5-amp. snap switches, otherwise as per Item 16.

Item 18.—Thirteen 5-amp. snap switch and single-receptacle unit, double-pole, in steam-tight iron or brass box, complete with all fittings and accessories.

Item 19.—Thirty-two 5-amp. snap switches and double-receptacle unit, otherwise as per Item 18.

Item 20.—Twenty-five 5-amp. single receptacles, without switch, otherwise as per Item 18.

Item 21.—Thirty junction boxes, fused, steam-tight or vapor-proof, iron or brass box, complete with fuses and all necessary accessories, including 100 extra fuses per vessel.

Item 22.—Seventy-five branch boxes, unfused, steam-tight or vapor-proof, iron or brass box, complete with all necessary accessories.

Item 23.—Four distribution panels, six double-pole fused circuits, non-water-tight construction, in iron box with lock, runways for wires, without main switch or fuses, complete with all necessary fittings, lugs, terminals, cartridge fuses (and fifty extra cartridge fuses per panel), number plates, name plates and other appurtenances.

Item 24.—Three distribution panels, eight double-pole fused circuits, and otherwise as per Item 23.

Item 25.—One blinker controller, consisting of suitable key with ¼-in. D. coin-silver contacts, and condenser, all contained in a weatherproof iron or brass box designed for mounting upon railing, including all fittings and accessories for operating the blinker lights (Item 10).

Item 26.—One telltale board for three circuits, with lamps and vibrator to indicate when signal lights are either burning or out, with necessary spare parts.

Item 27.—Seventy plugs for portables to fit receptacles of Items 18, 19 and 20 complete, without cord.

Item 28.—Thirty-six hooks, iron or brass, designed for mounting on bulkhead to support portables.

Item 29.—One connection box, iron or brass, with terminals for interconnecting feed wires, blinker controller, blinker snap switch and blinker light.

Item 30.—750 clips for ½-in. conduit, either strap iron or malleable casting.

Item 31.—125 clips for 1-in. conduit, either strap iron or malleable casting.

Item 32.—3000 ft. conduit, ½-in., galvanized or sherardized, N. E. C. S., with couplings.

Item 33.—550 ft. conduit, 1-in., galvanized or sherardized, N. E. C. S., with couplings.

Item 34.—3500 ft. wire, duplex, No. 14 B. & S. gage, double-braid, rubber-covered, N. E. C. S.

Item 35.—150 ft. wire, duplex, No. 12 B. & S. gage, double-braid, rubber-covered, N. E. C S.

Item 36.—1000 ft. wire, single-conductor, No. 6 B. & S. gage, double-braid, rubber-covered, stranded, N. E. C. S.

Item 37.—250 ft. wire, single-conductor, No. 2 B. & S. gage, double-braid, rubber-covered, stranded, N. E. C. S.

Item 38.—1500 ft. cotton-braid, reinforced No. 14 B. & S. gage cord, for all portables, desk lamps, fans, etc., N. E. C. S.

Item 39.—One tool box, hardwood, with lock and two keys, containing the following: twelve sheets crocus cloth, twelve sheets emery cloth, twelve assorted files, 2 lb. fuse wire (3 amp.), one 16-oz. ball peen hammer, one pair 5-in. diagonal cutting nippers, two pairs 6-in. combination pliers, one pair 10-in. combination pliers, twenty-four sheets assorted sandpaper, 2½-in. Champion screwdriver, 8-in. Champion screwdriver, one 12-in. Champion screwdriver, one pointed soldering iron (1 lb), 2 lb. tubular solder, 2 lb. friction tape (¾-in.), 2 lb. rubber insulation tape (¾-in.), one Stillson wrench (6-in.), one monkeywrench

(6-in.), one gasoline blow torch (1 pint), one hacksaw (9-in.) with twelve blades, one wire peeler, one electrician scissors (5¼-in.), one combination tool set with nine attachments, and one wire gage.

Item 40 (a) to 40 (n).—Spare parts:

One set contact points for blinker controller (Item 25).

Twenty-four gaskets for deck and bulkhead fixtures (Items 1 and 2).

Six globes for deck and bulkhead fixtures (Items 1 and 2).

Six guards for portables (Item 8).

Two guards for portables (Item 5).

One guard for portable (Item 4).

Twelve sockets for deck and bulkhead fixtures (Items 1 and 2).

Two guards for bulkhead fixtures (Item 2).

Six globes for sidelights (Item 11), half red and half green.

Two globes for anchor lights (Item 12).

Two globes for range lights (Item 13).

Two globes for stern lights (Item 14).

Two globes for masthead light (Item 15).

Six handles for switches in distribution panels (Items 23 and 24).

All the aforesaid electrical material shall conform strictly to the requirements of the National Board of Fire Underwriters and shall comply with the rules and regulations of the American Bureau of Shipping and of the United States Steamboat Inspection Service, wherever such rules are applicable. Parts as far as practicable shall be interchangeable. Devices are to be the very best in material and workmanship. No lamps are to be furnished.

The manner in which the aforesaid electrical material is to be installed is shown in detail on an attached blueprint. All proposed devices and wiring material must be perfectly suited to the purposes of the contemplated installation, and particularly must outlet boxes, junction boxes and other fittings be provided with suitable connections for the particular point of installation.

The material is to be well packed to prevent breakage and is to be made up so that one or more units may be shipped to any point in the country.

Bidders must submit with their proposal either drawings showing the proposed equipment and material in detail or else a sample of the proposed devices, preferably the latter when not too bulky. Tenders are to be accompanied by complete specifications, characteristics and performances of the materials and devices proposed and of the construction employed in the manufacture thereof, so that the corporation may decide in regard to the suitability of the materials which it is purposed to furnish. Bidders are to state the place of manufacture and the point of delivery, and in event a bidder is not the manufacturer of the devices or material offered, the name of the manufacturer is to be stated in the proposal. Weights, both net and shipping, are to be stated.

## UNUSUAL STRAIN UPON RAILROADS

### War Board of the Carriers Asks Commissions and Public Authorities Not to Force Unnecessary Improvements

The Railroads' War Board has addressed a plea to public service commissions and all state, county and municipal authorities throughout the United States urging co-operation with the railroads in a suspension during the period of the war of "all efforts not designed to help directly in the winning of the war."

Specific suggestions which the Railroads' War Board makes are embodied in a letter forwarded by Chairman Fairfax Harrison. Mr. Harrison says in part:

The railroad committee earnestly recommends that during the war the railroads be required by the public authorities to make improvements and carry out projects involving the expenditure of money and labor only when they are absolutely essential for war purposes or public safety. The prevailing high interest rate on money, the difficulty of raising money in competition with the tax-free issues of the government, the excessive cost of supply and labor, the delay in obtaining material, the possible blockade of traffic and the diversion of labor all contribute to make non-essential construction undesirable during the war.

## AMERICAN GAS & ELECTRIC SUBSIDIARIES RAISE RATES

### Increase in Power Rates in Most of Communities Served Approximates 25 per Cent Except in Scranton Territory

Subsidiaries of the American Gas & Electric Company have made application, or have filed schedules, for an increase in power rates to offset the unusual cost of coal and materials in most of the communities served. Such increases are now effective in nearly all the communities served in Ohio and in all the communities served in Pennsylvania and in the territory served by the Muncie Electric Light Company in Indiana.

The increase in rates is approximately 25 per cent, except in the territory served by the Scranton Electric Company, where the increase is approximately 18 per cent. The smaller increase in the Scranton territory is due to the proximity of the coal mines and to the ownership by the Scranton Electric Company of large culm deposits.

No increase in lighting rates is contemplated at this time.

The recent decision of the Indiana Public Utilities Commission authorizing the Muncie Electric Light Company to add a surcharge of 0.5 cent per kilowatt-hour to bills of all power consumers, thus recognizing the necessity of relief to the utilities, is considered gratifying and fair.

## CHANGE INDIANA PETITION FOR WAR RATE SURCHARGE

### Public Service Commission Rules That Companies Must File Individual Applications Instead of Acting Through Association

The Indiana Public Service Commission, after hearing arguments against the form of the joint petition for a surcharge of 30 per cent on all bills by members of the Indiana Electric Light Association, ruled that it would be safer for the individual utility companies concerned to file individual petitions asking for relief. The consolidated hearing on these petitions will begin on Aug. 20, the commission announced. It is the plan to have a joint hearing, including a number of cases in one proceeding.

The hearing on Monday, July 23, was given to arguments on the form of the blanket petition for higher rates filed by the electric association. A group of authorities of cities in the State, headed by W. A. Bond, city attorney of Richmond, argued against the legality of consideration by the commission of the blanket application for a surcharge.

The request of the commission that the various companies file individual opinions will avoid any question in the future as to the form of petition.

William J. McInerny of South Bend, defending the form of the petition on behalf of the association, said that the companies were willing to amend their plea so as to permit separate decisions in regard to each company.

Late advices are that the two Indianapolis companies have filed a joint petition and that the commission has set Aug. 7 as the date for hearing the case as it applies to Indianapolis.

## DISTRIBUTING AGREEMENT IS MADE BY LOS ANGELES

### Agreement with Private Companies Extended to July 1, 1919, with Sanction of Railroad Commission—Suit Against City Is Affected

The city of Los Angeles has extended until July 1, 1919, the temporary operating agreement between the city and the two companies recently consolidated into the Southern California Edison Company. This agreement, described in the ELECTRICAL WORLD of May 19, was first entered into for a two-month period ended July 1, 1917. The two-year extension and the agreement have been approved by the California Railroad Commission.

The new agreement is practically the same as the one previously in effect. It states that Los Angeles has arranged to buy the electric distributing systems of the two companies within the city, that bonds must be voted and sold by the city to buy the properties, that the city is operating its own hydroelectric plant in San Francisquito Cañon with a capacity of 37,000 hp. and proposes to build other plants and possibly to buy a steam-electric generating plant of the Los Angeles Gas & Electric Corporation in Los Angeles, and that the city wants to sell consumers within the city its electrical energy and has arranged with the two corporations, pending payment of the purchase price of $8,270,000, to operate their Los Angeles distributing systems for the benefit of the city.

The company shall retain from the revenue collected 8 per cent interest a year, payable monthly, on $8,270,000, the assumed fair value on Jan. 1, 1917, of the distributing systems affected by the agreement, on such sum as shall be determined by the Railroad Commission as the value of distributing systems of the companies in the Westgate Annexation District, and also on the actual cost to the companies of extensions and betterments made since Jan. 1.

The companies agree to buy and distribute all the electricity generated by the city's plants and not distributed over the city's own electric system, and to supply the city with additional power necessary to serve the city's consumers, but the electricity to be bought from the companies monthly is not to be less than a maximum yearly peak demand of 25,000 hp. at an annual load factor of at least 36 per cent.

The companies are to maintain distributing systems in good operating condition and extend and improve them as necessary. Maintenance, extension and conduct of the business are to be overseen by two representatives designated by the public service commissioners, two by the companies and a fifth arbiter in case of dispute. The Railroad Commission is to be final umpire.

The companies are to collect all bills from consumers and pay to Los Angeles daily the amounts collected less 8 per cent interest and the actual cost incurred monthly for operation and maintenance, including taxes and licenses, but not including replacements, extensions or betterments.

A depreciation allowance at the rate of 3.36 per cent a year is to be retained monthly, to constitute a fund to be held in trust by the companies, with interest at 4 per cent, and out of the aggregate the cost of necessary replacements is to be paid. If the property is purchased by the city, any unexpended balance in the depreciation fund is to belong to the city, but if otherwise the company is to keep the fund.

The city agrees not to parallel or duplicate distributing systems of the companies during the agreement, but this restriction is not to apply to city construction of lines for transmission or street-lighting. The agreement remains in force until July 1, 1919, with the right of the city at any time upon three months' notice to terminate the agreement, and subject also to determination by the voters.

The Los Angeles Gas & Electric Corporation has been seeking an injunction in the Los Angeles courts to prevent continuation of the agreement. After submission of all evidence the case was continued until after the commission's decision as to approval of the plan had been announced.

The corporation also appeared before the commission to protest against approval of the agreement, which, it was claimed, violated the State constitution and the Los Angeles city charter. It was also claimed that the estimate of the Edison and Pacific companies' properties used is too high, that the rate to be paid by the city for electric energy is excessive, and that the minimum amount of electricity which the city obligates itself to buy from the companies is greater than the amount that the city would use if it operated to capacity its San Francisquito plant.

The commission makes it clear that it is not passing upon the reasonableness of any rate now in effect or on discrimination in any rate, and also that it does not pass on any portion of a purchase agreement for these distributing lines which has been made but not yet put up to voters.

The city will buy from the companies electricity at from 1.22 cents per kilowatt-hour to 0.5 cent per kilowatt-hour, depending upon the varying annual load factor, these charges being based upon cost of supplying electrical energy at substations of the companies. The commission says that an analysis shows these rates to approximate actual cost to the company. The minimum annual payment to be made by the city to the companies for electricity is to be $717,530. Between May 1 and June 13 the city realized $85,740 from wholesale sale of power.

Failure of the two-million-dollar power bond issue on June 5 automatically prevents, under terms of the charter, consideration of the twelve-million-dollar bond issue for at least six months. Under these conditions it has been suggested that the differences between the city and the Los Angeles Gas & Electric Corporation might be arbitrated so that there would be complete municipal ownership and control of power. Effort is being made in this direction so as to avert, if possible, the long-drawn-out power war.

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## Explaining Electrical Activities

Under the title "Aims and Achievements," the Society for Electrical Development has issued a handsome booklet containing a brief summary of what the society is accomplishing for its members and for the entire electrical industry. The booklet contains thirty-six pages, including eleven full-page plates and a double-page chart.

## I. E. S. MAKES PLANS FOR ITS CORRESPONDENCE CONVENTION

### To Take the Place of Regular Meeting—First Papers to Be Released During September, Others to Follow in Succeeding Months

The Illuminating Engineering Society's correspondence convention, which this year will replace the regular annual convention, will be inaugurated during September by the release of the following papers: Presidential address, by W. J. Serrill; report of committee on nomenclature and standards, Dr. A. E. Kennelly, chairman, and C. H. Sharp, secretary; "Illuminating Engineering Publicity," by G. H. Stickney; "Economics of Large Building Lighting," by C. L. Law and J. E. Buckley; "Illumination Intensities in Large New York Department Stores," by W. F. Little and J. F. Dick.

President Serrill's address, not being submitted for discussion, will appear in the *Transactions* of the society issued about the first of September. The three papers and the report will be distributed in pamphlet form to any one who applies for them to the society at its headquarters, 29 West Thirty-ninth Street, New York City. A general invitation is issued for written discussion of each of these papers to be printed with the names in the *Transactions* of the society. Any of these papers may be presented before meetings of sections of the society during the month of September. They will be released to the technical press for publication in full or in abstract at any time subsequent to Sept. 20.

Other papers of this correspondence convention will be released in October, November and December.

## PUSHING THE CAMPAIGN TO KEEP BUSINESS GOING

### Society for Electrical Development Says That Possibilities Were Never so Great as at the Present Time

The Society for Electrical Development has sent to its entire mailing list of more than 20,000 a circular announcing its "Keep Business Going" campaign.

The circular contains a letter to the industry by Henry L. Doherty, president of the society. It suggests that in view of the greatly widened market for electric service, it is time to concentrate on building business.

*A Campaign*
*To Help*
*Make*
*Good Business*
*Better*
*For the Entire*
*Electrical*
*Industry*

The possibilities of electric power to replace steam power, of electric light to protect bridges, munition plants, waterways and work shops, of electrical appliances to lighten the labor of the home and on the farm, were, according to the circular, never so great as at this moment.

The society urges the sales side of the industry to seek out new possibilities of serving the public. It suggests that many power-consuming devices which formerly might have been thought to be luxuries are now certainly proved to be necessities.

The keynote of the new campaign is that business must be kept going if the banks, merchants, lighting companies and other commercial interests are to contribute their share to the national defense.

## GOVERNMENT SHIPMENTS TO HAVE THE PRECEDENCE

### Estimated that During the Next Few Months More than 100,000 Cars Will Be Needed for Government Uses

Plans for the solution of one of the most important transportation problems thrust upon the railroads of this country by the war have been adopted by the Railroads' War Board after a series of conferences with authorized representatives of the army, the navy and the United States Shipping Board. The problem concerns the supply and prompt movement of the thousands of cars required by the government to transport lumber and other supplies.

Under the plans agreed upon by the Railroads' War Board and representatives of the government, the government will give advance notice to the War Board's commission on car service whenever orders are placed for more than ten carloads of materials or supplies.

The government will also issue where necessary, through its authorized representatives, orders to the railroads on which the supplies are to be shipped, instructing them to provide the number of cars ordered within the time specified and at the shipping points designated.

To prevent shippers from utilizing for their own selfish purposes cars needed for government service, the Railroads' War Board has issued strict orders to all the railroads absolutely to forbid shippers the use of any of the government-ordered cars for any purpose except the loading specified in the government order.

## INVESTIGATING UTILITIES IN STATE OF NORTH DAKOTA

### Hagenah & Erickson Making Inventories and Will Also Examine Accounts of Properties for State Officials

A committee of officials of North Dakota, consisting of the Governor, Attorney General, the chairman of the State Tax Commission and chairman of the State Railroad Commission, has engaged Hagenah & Erickson of Chicago to investigate all public utilities in the State, the purpose of the investigation being to supply the state departments with accurate data regarding these properties. The investigation will embrace detailed inventory and appraisal of each property and an analysis of earnings and operating expenses for a number of years.

The appraisal work has been in progress for several weeks, and engineers from the firm are now making inventories in Bismarck, Fargo, Grand Forks, Minot, Jamestown, Mandan and many smaller cities. Certified public accountants in their employ will examine the books after completing the appraisals.

## REDUCTION IN RATES ORDERED IN EUGENE, ORE.

### Municipal Plant Directed by State Commission to Lower Its Schedules for Electrical Energy—Minimum Charge Reduced

Several months ago the municipal water board of Eugene, Ore., requested the Oregon Public Service Commission to make a survey of the Eugene water and light plants with an idea of ordering a more desirable set of rate schedules. The commission has ordered a substantial reduction in electric light and water rates. The city commission has accepted the report and has ordered the new rates into effect.

The outstanding feature of the new rates is the 75-cent minimum charge for electric light instead of $1. A brief summary of the new residential rates follows:

Metered Service—To cover each service connection on all residences.

Primary Rate—Applies only to first 50 hours' use per month per kilowatt of consumers' active load: First 6 kw.-hr. or less, 75 cents; all over 6 kw.-hr. or less, 5 cents.

Secondary Rate—Applies only to consumption in excess of first 50 kw.-hr. used per month per kilowatt active load: First 50 kw.-hr., per month, 3 cents; all over 50 kw.-hr., per month, per kilowatt-hour, 2 cents.

Minimum Monthly Charge—75 cents plus 10 cents for each 100 watts or major fraction thereof of active load in excess of 500 watts.

Small heating, cooking and power devices, with an aggregate connection rating of not more than 2 kw., including small motors with a maximum individual rating of 1 hp. output (1 kw. input), if served under these rates and through the lighting meter, may be connected without being included in the active load on minimum charge.

Heating and cooking devices in excess of 2 kw. of aggregate connected rating will not be included in the active load, but will be assessed a minimum charge of 50 cents per kilowatt in addition to the regular lighting minimum.

The commercial lighting rates are as follows:

To cover each service connection on all commercial loads: First 50 kw.-hr. used per month per kilowatt of active load will be at the primary rate. All excess consumption over 50 kw.-hr. per month per kilowatt of active load will be at the secondary rate.

Primary Rate—First 6 kw.-hr. or less, 75 cents; excess over 6 kw.-hr., per kilowatt-hour, 5 cents.

Secondary Rate—First 100 kw.-hr., per kilowatt-hour, 4 cents; next 200 kw.-hr., per kilowatt-hour, 3 cents; over 300 kw.-hr., per kilowatt-hour, 2 cents.

Minimum Monthly Charge—75 cents plus 10 cents for each 100 watts or major fraction thereof of active load in excess of 500 watts.

No conected load will be considered less than 500 watts.

Small heating and power devices, with an aggregate connected rating of not more than 2 kw.-hr., including small motors with a maximum individual rating of 1 hp. output (1 kw. input), if served under these rates, and through the lighting meter, may be connected without being included in the active load or the minimum charge.

The Oregon commission has given considerable attention in the last year or two to the form and application of electric rates, and the ELECTRICAL WORLD for June 2 published the complete residential and commercial power rates for the city of Portland. A comparison of the two residential lighting rate schedules will be of considerable interest.

In comparing the schedules consideration should be given to the fact that the population served by the Portland Railway, Light & Power Company is in the neighborhood of 300,000, while that served by the Eugene municipal lighting plant is approximately 10,000.

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## MR. HARRIMAN ON NEW ENGLAND HYDROELECTRIC DEVELOPMENT

### Growth of New England Power Company and Its Economic Influence on Energy Supply—Problem of Coal Cost

Growth of the New England Power Company and its economic influence in the supply of electricity were discussed recently by President Henry I. Harriman at a hearing before the Massachusetts Gas and Electric Light Commission. The board was considering the issue of $7,000,000 additional stock and bonds to meet the cost of a new hydroelectric development on the upper Deerfield River at Readsboro, Vt., and various transmission line and substation work, outlined in the ELECTRICAL WORLD of June 30, 1917.

Mr. Harriman stated that output of the system had increased from 34,000,000 kw.-hr. in 1910 to 245,000,000 kw.-hr. of the end of 1916. High coal cost and pressing demand for power greatly in excess of output of the present developments make necessary the immediate acquisition of new sources of power. It is estimated that the work will cost $7,010,000, divided as follows:

| | |
|---|---|
| Increasing capacity of certain existing lines by adapting them to 110,000-volt operation | $600,000 |
| Construction of Readsboro development (22,000 kw.), with dam, tunnel, etc. | 5,614,000 |
| Construction of new lines | 360,000 |
| Construction of new substations | 155,000 |
| Extensions to existing lines | 30,000 |
| Extensions to existing substations | 190,000 |
| Additions to Station No. 5, above Hoosac Tunnel | 61,000 |

During the history of the company, which is a wholesaler, power has been sold at the switchboard at between 7 mills and 8 mills per kilowatt-hour, dividing the entire income by total output. Variations have depended upon the relative amounts of primary and secondary power sold. Thus, in 1914, a low-water year, with little secondary power output, the price averaged 8 mills at the switchboard; in 1916, a good water year with high prices of coal and other supplies, it averaged 7.6 mills. This last figure applied also to the first five months of 1917. Actual prices paid by customers were about 16 to 18 per cent above the foregoing, on account of electrical losses in transmission and conversion.

#### NEW ENGLAND POWER COMPANIES—PRODUCTION, SALES, ETC.

Since the beginning of operation in 1910 to June 1, 1917, total production of the system has been 910,528,499 kw.-hr. Primary sales at the switchboard totaled 603,961,029 kw.-hr., and the revenue per kilowatt-hour from primary sales was 1.027 cents. Secondary sales totaled 182,927,715 kw.-hr., yielding 0.485 cent each. Line and transformation losses totaled 123,639,755 kw.-hr., or an average of 13.58 per cent. In general, the consumer pays around 1 cent for primary power and about 6 mills for secondary power per kilowatt-hour. In general, also, purchased power taken from other plants or systems has cost about 1 cent per kilowatt-hour. As

a rule, the price to the consumer is the price at the street voltage, the consumer installing his own transformers, although this arrangement is not universal. The load has now reached a point where it is necessary to purchase steam power throughout nearly the year. Mr. Harriman said:

The amount of energy which we purchase is according to stream flow. We purchase from various electric companies. Their contract with us, as a rule, is on the basis that they will deliver electricity if they have capacity to spare. It is not in a sense primary power for which they have to reserve capacity. Electric light companies have their high load and must have their high load from 4 to 6 p. m. in October, November and December. An average company must have about 50 per cent greater demand at that time than in summer. Our low-water period practically comes always in the summer, therefore electric companies practically always have capacity available when we require it, and in that way we have been able to make arrangements which I think are jointly profitable, in that it doesn't require additional capacity and consequent interest charge to make up the deficiencies on the system; but we have now reached the point where it is necessary to carry some load on steam practically throughout the year.

The demand for power is more active to-day than it has ever been before. The system closed a contract a few weeks ago for 4000 kw. in Rhode Island with the largest cotton mill corporation in the State. We had an application—now a contract agreement—for between 4000 kw. and 5000 kw. for one customer in Massachusetts, and face the question whether we are practically to stop business until prices go down or will go ahead on the present basis of cost.

Secretary Lane recently made a rather interesting statement. He urged all hydroelectric companies to increase their capacity to the utmost, first, to offset the present high cost of coal; but he emphasized the fact that even though this development was not finished until after the war, destruction of life would so decrease labor supply throughout the world that he felt that common labor in particular would be high for many years, and that meant that coal prices would be up very materially above normal prices of the last ten or fifteen years. I don't mean to imply by that that I think, or that the Secretary implied, that coal would stay at its present exorbitant price, but our own best estimate is that coal will be from $1 to $2 per ton ($1.10 to $2.20 per t.) higher on the average for the next ten years than it has been throughout the last ten years, and that, of course, is due primarily to scarcity of common labor from which coal miners are recruited and to consequently higher wages.

I compiled a few figures to show from the standpoint of coal output what our hydroelectric output meant. For instance, the output of the system for the present year will be certainly in excess of 250,000,000 kw.-hr. of hydraulic energy. Now, if you assume a coal consumption of 3 lb. (1.36 kg.) per kilowatt-hour, which is a fair assumption for the average cotton, woolen or paper mill to which we would sell power, that means that hydroelectric power is equivalent to 375,000 tons (337,500 t.) of coal. The additional plant (and reservoir) which we purpose to develop is estimated to produce about 112,000,000 kw.-hr. yearly, equivalent to about 170,000 tons (153,000 t.) of coal. The saving is not only in coal, but in transportation and equipment. For instance, a railroad man informed me that the whole 375,000 tons (337,500 t.) of coal sent into New England would mean 12,500 carloads. That would mean the continuous use of practically 1000 cars throughout the year. Now, I don't need more than to state the fact of the value it means to release rolling stock and other railroad equipment at this time.

### NOTABLE FEATURES OF READSBORO DEVELOPMENT

Mr. Harriman added that while the company would be glad to make a smaller development at Readsboro than the one indicated if it were feasible, the engineering problem practically dictates that one development shall be constructed on the site. In general, the plan is to construct a dam nearly 200 ft. (60.9 m.) high on the Deerfield River above the town. The dam will probably be the largest earth dam in the world, with a concrete spillway on one side to take care of any surplus water. It will create a storage reservoir of about 3,600,000,000 cu. ft. (305,000,000 cu. m.) capacity. From the dam a tunnel 14,000 ft. (4267 m.) long will lead to a power plant with an installed capacity in waterwheels of about 36,000 hp., operating under a maximum head of 390 ft. (118.8 m.). Even if no hydroelectric station were built at this site, the creation of the reservoir and the conservation of water secured will add 44,000,000 kw.-hr. to the output of the present power houses on the river. In the new power house will be generated about 64,000,000 kw.-hr., so that the total added on the Deerfield River will be around 108,000,000 kw.-hr.

In addition, the creation of this new reservoir will allow the Vernon plant on the Connecticut River to run at a somewhat higher load factor and enable the Vernon station to turn out about 4,000,000 more kilowatt-hours than at present. High and low water do not occur absolutely simultaneously with the two rivers. The Somerset reservoir added 21,000,000 kw.-hr. to the low-water flow of the Deerfield. Storms do not always strike the two basins in their course, and through careful load dispatching the various stations are handled so as to utilize the stream flow at each plant to best advantage.

## EXHIBITING MODEL OF A HYDROELECTRIC SYSTEM

### Operating Department Employees of New England Power Company Prepare Model for Displays of Local Boards of Trade

Employees of the operating department of the New England Power Company, Millbury, Mass., have completed a model of the system, as illustrated herewith,

MODEL OF NEW ENGLAND HYDROELECTRIC SYSTEM

for exhibition in connection with a local board of trade display.

The model shows in paper-pulp the topography of the watersheds and the arrangement of plants, lines and substations at all important points. Miniature steel towers with fiber disk suspension and strain insulators are connected by bare copper wire and the overhead ground wire is shown as in service. Models of oil switches and transformers at open-air switching stations are shown, together with cardboard building mod-

els and appropriate depressions representing reservoirs. When surrounded by maps and photographs the model becomes the nucleus of an exhibit of no little technical as well as popular interest.

## ELECTROCHEMICAL SOCIETY MEETING TO BE IN PITTSBURGH

### Special Features of the Sessions from Oct. 3 to 6 Will Be Papers and Discussions on Electrochemical War Supplies

The thirty-second general meeting of the American Electrochemical Society will be held in Pittsburgh on Oct. 3 to 6. A special feature will be papers and discussions on electrochemical war supplies and the part the electrochemical industry will play in the struggle.

The committee in charge is outlining an elaborate plan of technical sessions, visits to industrial plants and entertainment features. It invites delegates to arrive on Oct. 2, so as to get together informally and enjoy some recreation.

On Oct. 3 a regular meeting will be held in the morning, with optional excursions to industrial plants in the afternoon. In the evening an illustrated lecture will be given.

On Oct. 4 a symposium on "Electrochemical War Supplies" will be held in the morning, followed by excursions to industrial plants in the afternoon. A subscription dinner will be held at the William Penn Hotel in the evening, with special entertainment features. The ladies are especially invited.

Saturday, Oct. 5, will be devoted to an all-day excursion on a special train, with complimentary luncheon, to several industrial plants.

## ELECTRICAL MEN ARE NEEDED BY THE ARMY

### Telegraph Operators Especially Are Required—Movement Instituted at Chicago to Help Recruiting for Signal Corps

At a meeting convened in Chicago at which the greater portion of the electrical industry in the city was represented by executive officers of various concerns, an advisory committee of the electrical industry of the State Council of Defense for Illinois was formed. With Samuel Insull, chairman of the State Council of Defense, presiding, the following committee organization was worked out: Consulting board, Louis A. Ferguson, vice-president Commonwealth Edison Company; H. M. Byllesby, president H. M. Byllesby & Company, and B. E. Sunny, president Chicago Telephone Company; committee chairman, A. H. Krom, general manager American Association of Engineers; vice-chairman, L. C. Spake, ELECTRICAL WORLD; secretary-treasurer, H. A. Mott, Chicago Telephone Company.

Colonel Wildman, U. S. A., summed up the recruiting for the Signal Corps as follows: "We should have had 2800 men by July 1, and practically promised the chief signal officer that this number would be recruited by that time; 1800 men have been actually recruited, and in addition to this there are a possible 200 or 300 that have not reported. The most needed are telegraph operators. There are two reasons why we cannot get them quickly: First, there are not enough operators of recruitable age in the country to be diverted to the army without decreasing efficiency of commercial companies and thereby decreasing efficiency of the army which utilizes commercial companies. Commercial companies are releasing men as far as possible by employing girls, boys and old men to operate mechanical devices which supplant hand operators. Second, in addition to telegraph operators, the Signal Corps must be supplied with engineers and mechanics skilled in every branch of the electrical trade. It must be possible for the force to rehabilitate completely wrecked power stations and to do other work of that character."

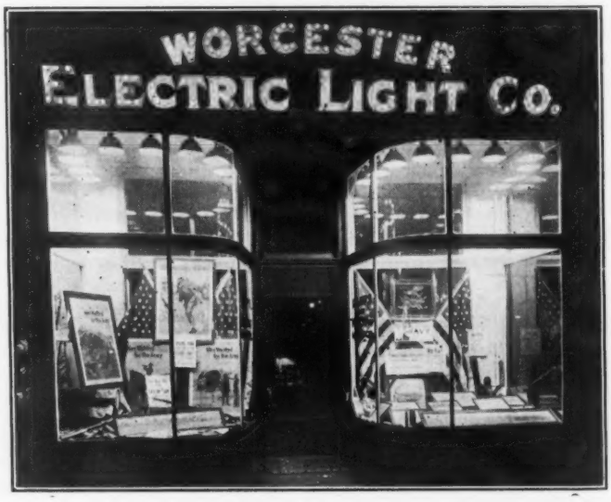
Samuel Insull said: "We will have to organize our own industry just as other industries have organized. It has been found necessary to do so in Europe, and if the war lasts long enough we may get to a point where we shall have to pick out certain men just to operate certain necessary industries, and industries that are not necessary will have to go by the board.

"We hope, of course, that such a situation will not arise, but our government is going ahead on the basis that it is going to be a very long war. The best opinion is all to this effect. I think that the first thing we should do is to fill up the electrical branch of the army; that is what the Signal Corps really is."

## CENTRAL STATION HELPS IN THE ENLISTMENT WORK

### Worcester Electric Light Company Uses Its Windows for Displays to Attract Men to Military and Naval Service

Central station co-operation with the government to encourage army and navy enlistments is shown in the accompanying photograph of a window display established recently by the Worcester (Mass.) Electric Light Company at its main offices. One window was devoted




DISPLAY IN A CENTRAL STATION WINDOW TO AID RECRUITING

to army and the other to naval exhibits furnished by the authorities, the embroidered silk-crossed flags at the rear of the naval window having been brought from the Philippines by an officer. The display was illuminated in each window by nine 100-watt gas-filled lamps and attracted a great deal of favorable press and popular comment.

# Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

**Contract with Municipality.**—A corporation may receive a grant of franchise for a term of years extending beyond the life of the corporation, the Court of Appeals of Kentucky held (195 S.W. 1097). In view of a statute expressly giving the city councils of cities of the fifth class power to contract for supplying the city with light, under a valid electric lighting franchise granted by such a city running from Sept. 21, 1911, to Sept. 21, 1931, a contract made on Sept. 21, 1911, for furnishing the city electric light from Feb. 1, 1912, to Feb. 1, 1932, was not wholly invalid under the law forbidding municipalities to make such a contract for a term exceeding twenty years, but was enforceable during the existence of the franchise, and only invalid and unenforceable after the expiration of the period for which the franchise was granted.

**Contributory Negligence in Case of Telephone Lineman Shocked by Contact with Power Company's Lines.**—Where an electric power company constructed its line on a highway over and across a telephone company's service line, whether it was negligent in failing to protect such wires from contact with telephone wires, in consequence of which failure a telephone lineman was injured, was for the jury, although the accident occurred in a manner which the power company could not foresee in specific detail, the Supreme Court of Iowa held in Toney versus Interstate Power Company (163 N.W. 394). In such case a lineman injured while engaged in repairing the telephone service wire was neither a wrongdoer nor a mere naked licensee, so far as defendant power company was concerned. Where in the lower court the defendant succeeded in excluding evidence that its wires were in the highway as being immaterial to its liability, it could not on appeal urge that its line was outside the highway upon a private right-of-way. That other electric companies generally do not use nets and guards and insulating covers prescribed by law is no defense for a power company's failure to comply with these requirements. The statute applies to a case where an electric power company has constructed, although prior to the enactment of the statute, its line on a highway over and across a telephone company's service wire. An electric power company's duty to protect from injury from its wires applies to dangers not only from currents transmitted but also from static electricity accumulating on its wires. That the telephone lineman failed to observe that a telephone wire which, in tightening, had escaped him had recoiled over a power company's wire which he knew was uninsulated did not show his contributory negligence as a matter of law. Damages of $8,500 for injury by electric shock to telephone lineman, thirty-one years old, married and earning $55 a month and expenses, the evidence as to the permanency of the injury being conflicting, was held not to be so large as to show passion or prejudice, but to be a reasonable compensation for injuries due to the negligence of the power company in constructing its line as described and omitting to take proper precautions against such injuries.

**Contributory Negligence in Case of Absence of Guards.**—In an action for death of an employee, a complaint charging that defendant did not furnish deceased with a safe place to work, in that its dangerous electrical appliances, including switches, were not safeguarded and protected, in consequence of which servants were exposed to such appliances and were liable to be killed or maimed by them, followed by particular allegations concerning the steps, platform, switch and fuse and the proximity of these, with the object of showing that one using what was provided for a passageway was liable to come into contact with the dangerous and deadly contrivances for handling electricity, sufficiently stated a cause of action based on negligence in not furnishing deceased with a safe place in which to work, it was held by the Kansas City Court of Appeals (195 S.W. 1055). The act of an employer maintaining in a power house in an unprotected state an apparently unmoving and silent deadly agency consisting of a switch on a slab carrying 500 volts of current in such proximity to a passageway which employees were authorized to use that a slight unbalance or misstep or accidental raising of the hand or extending of the arm would mean certain death was gross negligence. Where a power house employee was killed in a passageway by coming in contact with an exposed switchboard carrying a deadly current when he attempted to avoid another employee who was carrying tools on his shoulder, he was not guilty of contributory negligence as a matter of law, although he had been repeatedly warned of the passageway and that he should be careful to avoid injury. An instruction declaring as a matter of law that if deceased had been warned of the danger of the electric switches which killed him and knew where they were located, then in using the stairway which required him to pass by the switches he assumed the risk, was properly refused, since it ignored the duty of the employer to use ordinary care to furnish a reasonably safe place to work upon which plaintiff's action was founded. An instruction as to deceased having chosen the dangerous way was properly refused, since it was shown that the defendant authorized the use of such way, and the instruction was an attempt to relieve it of its negligence in maintaining that way.

# Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

**Obligation to Serve the Public.**—The California Railroad Commission has authorized the Great Western Power Company to construct, operate and maintain electrical transmission and distribution lines throughout Plumas County, except in territory reserved for the Grizzly Electric Company, Quincy Electric Light & Power Company and Plumas Light & Power Company. The commission permits the Great Western Power Company to continue to serve the Philadelphia Exploration Mine in the territory reserved to the Plumas Light & Power Company. The Great Western company is building a 50-mile 44,000-volt transmission line from its Las Plumas plant to Crescent mills. The cost is estimated at $154,000. The company urges that the needs of certain power consumers in Plumas County demanded early and favorable action by the commission. In referring to this request the commission says: "The commission will not be induced to act prematurely upon any matter on the plea that an emergency exists, particularly when, as in this case, it is obvious that the application could have been presented at a much earlier date." The Great Western company contended that the Plumas Light & Power Company occupies the position of a competitor, and that it should not be required to sell electrical energy to the Plumas company in excess of the amount provided for in the present contract between the two companies. The commission rejects the contention of the Great Western and requires it to sell to the Plumas company such electrical energy at reasonable rates as the latter may require for distribution and resale in that portion of Plumas County reserved to it. Referring to the right of public utilities to select their patrons, the commission says: "It is clearly the duty of a public utility situated as is the petitioner to supply every reasonable demand for service at non-discriminatory rates and under just terms and conditions. Nor can this duty be avoided, modified or abridged in any manner whatsoever, either by contract between the utility and any private interest or by the maintenance of unsuitable facilities for general distribution. It should be made perfectly clear that the rights under a general franchise granted by competent public authority are not to be construed as simply permissive privileges to be exercised at the option of the utility solely for its private gain, but such a franchise contemplates service in the entire territory covered by the franchise in a manner which will best serve public interests."

# *Current News and Notes*

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

**Further Restriction of Lighting in Berlin.**—An order has been issued restricting the lighting of stores, hotels, restaurants and cafés in Berlin to one-fifth of the degree of illumination permitted up to the middle of December, 1916, when the preliminary order affecting illumination went into effect.

**Move to Reduce Number of Lamps in Clusters at Columbus.**—Herman Gamper, consulting engineer at the municipal plant at Columbus, Ohio, is working out a plan to remove two of the lamps on all clusters in the business district, leaving three on each one. He claims that this will leave ample lighting capacity. Councilman Westlake will endeavor to have this plan incorporated in the street-lighting improvement plans, as he says that it will save the city $100 per day or $36,000 per year. He will also ask the Council to approve the use of red, white and blue globes on the lamps on High Street, as a recognition of the spirit of the times.

**Hearing on Cincinnati Gas & Electric Company Application for Bond Issue.**—Testimony was heard by the Ohio Public Utilities Commission on July 27 on the application of the Cincinnati Gas & Electric Company for permission to issue $2,500,000 first and refunding mortgage 5 per cent forty-year sinking-fund bonds. Vice-president F. T. Wickham testified that the proceeds are to be used in completing the new central station and purchasing equipment, for which $4,100,000 bonds were authorized in 1916. The outlay on the new station to May 31 is said to have been $1,878,344, and it is hoped to complete the plant before the lease on the Miami & Erie Canal water expires in 1918. Water for the new plant will be taken from the Ohio River.

**California Companies Seek Consolidation.**—The Sierra & San Francisco Power Company and the Yosemite Power Company have filed with the California Railroad Commission an application for authority for the latter company to sell to the former all the property in its La Grange division for $450,000, or such sum as the commission shall determine to be a fair price. The Sierra company operates an electric and water system in the counties lying between San Francisco and Tuolumne and also in Stanislaus County, and the La Grange division of the Yosemite company is in Stanislaus and Tuolumne Counties. The Sierra company has an authorized capital of $20,000,000, all outstanding, and $17,000,000 bonds. The company has paid no dividends. The Yosemite company has an authorized capital of $10,000,000, of which $2,050,000 is outstanding. It has bonds of $1,708,000. It has not paid interest on its bonds during the last fiscal year, and owes notes besides. The company says that the original cost of the La Grange division property to it was $473,700, and that its present reproduction value is $559,000. The Sierra company states that it wants to buy the property because it can manage it advantageously in connection with its other plants in Stanislaus County and elsewhere, and that the Yosemite company wants to sell because the communities served by it are growing beyond its capacity and it has no other electric power plants to meet the increasing demands for power. It has, says the company, large and varied property capable of developing electric power, and by transferring the operating property of the La Grange division to the Sierra company, the latter can serve these communities, while the Yosemite company can devote its efforts to latent properties.

**Hearing in Cleveland Rate Case.**—The hearing on the valuation of the property of the Cleveland Electric Illuminating Company before the Ohio Public Utilities Commission was completed on July 26. The hearing follows an appeal from an ordinance which sought to establish a rate of 3 cents for energy for domestic purposes in Cleveland. Company engineers placed the value of the property at $22,478,342, while engineers of the commission fixed a tentative valuation of $20,820,061. The chief witness for the city at the adjourned hearing, which consumed two days, was F. W. Ballard, former Light and Heat Commissioner of Cleveland. He declared the value of the property to be $11,913,061. According to his testimony, he took the company figures and rejected such items as he thought should not be included. Interest during construction, Mr. Ballard claimed, had been paid from earnings and should not be included in the capital account. Money supplied from the earnings to the upkeep fund and used for extensions was counted both in the upkeep fund and the extensions, he claimed. Many of the items included in the $6,000,000 of intangible values were thrown out by Mr. Ballard, because he thought that they should not be there. The company will make its contest against his testimony on the ground that he did not have sufficient time to make a proper investigation. Roy Husselman, employed as consulting engineer by the city, was cross-examined on his claim of $14,000,000 as a proper value for the property. The city presented testimony showing that the company since its organization in 1899 had paid $8,832,046 dividends. The best year was 1914, when dividends to common stockholders were $1,163,110. For the last two years the dividends have been $781,080 per year. The idea of the city in producing this testimony was to show that the company is paying too much in dividends and that some of this should go toward reduction of rates.

# *Associations and Societies*

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 239 of this number.

**Dayton Company Gives Dinner to Enlisted Employees.**—The officers of the Dayton Power & Light Company Section of the National Electric Light Association gave a dinner on July 12 to the employees of the company who are leaving it at the present time to go into active military service. Charles F. Bell, Charles E. Collins, Frank Kendig and Howard Tanzey have joined Battery D of the First Field Artillery, Ohio National Guard, and John Carrothers has joined Company C of the Third Indiana Infantry. M. H. Wagner, president of the section, was chairman at the meeting.

**St. Louis Jovians Have Excursion and Elect Officers.**—Nearly 2000 persons, including Jovians, their families and friends, attended the river excursion held aboard the steamer Alton at St. Louis on Friday evening, July 20. The event marked the retirement of E. H. Waddington as chairman of the entertainment committee after a very successful term of three years. The election of officers of the league for the coming term, held aboard the boat, resulted as follows: President, W. N. Matthews, president W. N. Matthews & Bro.; vice-president, E. H. Waddington, sales manager Western Electric Company; secretary-treasurer, George McD. Johns, superintendent fire-alarm system of St. Louis; executive committee, Bruce Cameron of the United Railways, C. E. Ruffner of the Electric Company, S. M. Boyer of the General Electric Company, and Horace Beck of the Light & Development Company.

**Annual Meeting of Society for the Promotion of Engineering Education.**—The twenty-fifth annual meeting of the Society for the Promotion of Engineering Education was held in Washington, D. C., July 6-7. As President Chatburn stated in his annual address, the meeting was transferred from Northwestern University, Evanston, Ill., to Washington, D. C., "because the exigencies of the times demanded that the meeting be held in proximity to those who were working out the measures for the successful prosecution of the war. We could not expect them to leave their work for two or three days, whereas if we came to Washington we might hope for an hour or two of the time of several persons in authority covering many branches of governmental service." The program was devoted to the general topic of "The Relation of Engineering Schools to the Government During War." Among the speakers were Secretary of War Baker and other prominent government officials.

BRIG. GEN. G. O. SQUIER

# *Men of the Industry*

Changes in Personnel and Position—Biographical Notes

**Brig. Gen. George O. Squier, U. S. A.,** chief signal officer of the army, has recently been made a fellow of the Royal Society of England in recognition of his invention of a new system of ocean cabling which, it is believed, will be of the greatest service in the war. A patent was obtained on the invention by General Squier on Wednesday of last week. He was graduated from Johns Hopkins University in 1893 and worked as a research student under the late Professor Rowland. He devoted especial attention to radio-telegraphy in military operations. In 1911 he presented a paper before the American Institute of Electrical Engineers on multiplex telephony and telegraphy by means of waves guided by wire, and in the following year he was awarded the Elliott Cresson gold medal for his researches in multiplex telephony. In 1912 he was appointed military attaché to the United States Embassy at London, and it was while in London that he applied for the patent which has just been granted to him.

**W. O. Haymond** has been appointed superintendent of power and will have charge of the plant of the Muncie (Ind.) Electric Light Company.

**I. B. Shepherd** has been appointed general manager of the Etowah (Tenn.) Water & Light Company, succeeding W. H. Price, who resigned.

**Homer Mock,** commercial manager of the Lancaster (Ohio) division of the Ohio Light & Power Company, has joined the Logan (Ohio) company of the Seventh Infantry.

**W. L. Barker,** electrical engineer of the Southern Utilities Company, consisting of electric, gas and ice properties in Florida, has resigned to accept the position of electrical engineer of the Manila (P. I.) Electric Railroad & Light Company. Both of these companies are under the management of the J. G. White Management Corporation of New York City. Before joining the organization of the Southern Utilities Company Mr. Barker was connected with the staff of the General Electric Company. He is a graduate of the Alabama Polytechnic Institute.

**F. A. Noyes** has been appointed division superintendent of the eastern division of the Consumers' Power Company, with headquarters at Saginaw, Mich. Mr. Noyes succeeds D. R. McDueffe.

**E. L. Whitehead,** who for a number of years has been chief engineer of the Kalamazoo steam plant of the Consumers' Power Company, has been appointed to the position of chief engineer of the company's plant at Battle Creek, Mich., succeeding T. M. Hooper.

**A. Larkin,** who for many years assisted E. L. Whitehead in the operation of the Kalamazoo steam plant of the Consumers' Power Company, has been appointed chief engineer of the plant, succeeding Mr. Whitehead, who has gone to the Battle Creek plant of the company.

**John F. Card,** for the last eighteen years superintendent and designing engineer of direct-current machinery for Fairbanks, Morse & Company at Three Rivers, Mich., has resigned to go into the manufacturing business on his own account. Mr. Card has been in the electrical machinery and manufacturing business for twenty-five years. He was at one time connected with the Triumph Electric Company of Cincinnati, Ohio, later going to Mansfield, Ohio, to organize the Card Electric Company, now known as the Phoenix Electric Company. After remaining with this company about five years, Mr. Card took up his residence at Three Rivers, Mich., during the spring of 1899, and organized the Three Rivers Electric Company, then owned by the Sheffield Car Company, but later purchased by Fairbanks, Morse & Company of Chicago. He was born in Illinois, received his education at Covington, Ky., and began his business career with the Card Electric Motor & Dynamo Company of Cincinnati, now the Allis Chalmers Company. Later he took charge of a large electrical repair shop after having been in the employ of the Cincinnati office of the General Electric Company for about one year retesting and rebuilding arc lamps and arc machines.

**Edward N. Hurley,** former chairman of the Federal Trade Commission, was appointed last week by President Wilson to head the Shipping Board. Mr. Hurley is well known as an electrical manufacturer, having been president of the Hurley Machine Company, manufacturer of electric washing machines, prior to his appointment on the trade commission. He resumed the presidency of this company early in 1917 on his resignation from the commission. Mr. Hurley was born in 1864 and entered railroad work in early life, serving as engineer for the Chicago, Burlington & Quincy Railroad until 1888, when he joined the United States Metallic Packing Company as a salesman, later becoming manager. In 1896 he resigned to organize the Standard Pneumatic Tool Company, his interests in which he sold in 1902, when he engaged in farming and stockraising. In 1913 he was appointed United States trade commissioner to the Latin-American republics. He was made president of the Illinois Manufacturers' Association in 1914, and in the following spring was appointed a member of the Federal Trade Commission.

E. N. HURLEY

## Obituary

**B. H. Durbin,** one of the best known younger electrical men in the Middle West, was killed in an automobile accident near Pittsburgh, Pa., on July 21, when a faulty steering gear threw the automobile over an embankment. For the last five years Mr. Durbin had been connected with the Bryan-Marsh division of the National Lamp Works of the General Electric Company, traveling out of its Kansas City office. He was an active Jovian, holding the office of statesman from Iowa.

**Albert Frederick Ganz,** professor of electrical engineering at the Stevens Institute of Technology, Hoboken, N. J., died suddenly on July 28. He was born April 25, 1872, at Elberfeld, Germany, and came to this country in 1881. He was graduated from Stevens in 1895 and entered the department of physics and applied engineering at the institute as an instructor, becoming assistant professor two years later and professor and head of the department of electrical engineering in 1902. Professor Ganz contributed largely to the development of engineering and of the technical press. He was known for his research work on electrolysis from stray electric currents. He was a member of a large number of national engineering societies and was a fellow of the American Institute of Electrical Engineers.

# REVIEW OF TRADE AND MARKET CONDITIONS

*News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods*

## LARGE OUTPUT OF PORCELAIN ELECTRICAL SUPPLIES IN 1916

### Domestic Market Buys $7,034,420 Worth, Which Is an Increase of $2,363,218 Over the Previous Twelve Months

The value of porcelain electrical supplies marketed in the United States in 1916 was $7,034,420, an increase of $2,363,218 over 1915, according to the United States Geological Survey, Department of the Interior. These wares were reported from ten states, of which Ohio was the leader, reporting wares to the value of $2,181,026. New Jersey was second, with $1,674,093, and New York third, with $1,623,433. These three states reported 78 per cent of the value of the entire output.

## WAR CREATES CHANGES IN DISTRIBUTION POLICIES

### Rule Not to Quote to Government but Only to Sell Through Regular Channels Temporarily Abandoned

It has been a policy with some manufacturers never to sell except through recognized local channels of distribution, such as agents or jobbers. A sales policy of quoting prices on and selling no complete apparatus to the user has been established, and manufacturers have declined to quote on or furnish apparatus direct to the federal government or to state or city governments purchasing apparatus for use by themselves.

War conditions have brought many readjustments and changes to every one. With a view to facilitating the conduct of the government during time of war and actuated by a patriotic desire to effect for the country at large any possible saving of time or money in the procuring of apparatus or material, one of the largest manufacturers of fan motors announces that it will until further notice quote on and furnish any apparatus or material its factory can supply direct to the federal government or any department thereof. Such orders and requests for prices will no longer be referred to dealers and wholesalers, but will be handled with all the dispatch which can be concentrated upon emergency purchases.

## GROWTH OF PLAN TO TIE UP WITH NATIONAL PUBLICITY

### Hotpoint Electric Heating Company Sends to Trade Comprehensive Plan for Its Advertising for Remainder of Current Year

With all the national advertising that is now being run in high-priced weekly and monthly magazines, tending to interest the ultimate consumer, it is doubtful if there is very much simultaneous advertising done by the trade. To a certain extent, of course, this has been due to misplaced confidence. It has not been unusual for manufacturers and large distributers, after going to the trade promising large advertisements in national magazines having immense circulation and urging the dealer to stock up in anticipation of the demand which this publicity would create, to back down on the publicity when the time came. A good many dealers, therefore, have taken the stand that they believe only what they see.

To come out, however, with a comprehensive campaign for national publicity in black and white covering a very definite period, showing the trade how it can tie up with it and furnishing for the trade all kinds of selling help such as window displays, newspaper advertisements, slides and information on merchandising, is a new step.

Two weeks ago the Western Electric Company brought out a book showing in detail all its dealer help and how they could be tied up with the national publicity campaign that it is continually running. This week the Hotpoint Electric Heating Company has brought out a book giving in detail the national publicity campaign of the company for the remainder of the current year, together with a complete catalog of all of its appliances with prices, sales help for the dealer for tying up with this publicity, sales plans for summer, fall and holiday campaigns in detail, and seasonable window displays with information on how to set them up.

These two books, while entirely different, aim to accomplish practically the same results. The dealer knows the plans of the distributer, knows how he can tie up with him, what help he can expect from him, and how to sell those goods in advance. The coming out of these two books at this time and so close together is significant, and there seems no doubt that a new era in electrical merchandising has been begun.

# THE WEEK IN TRADE

MARKET conditions generally showed little change during the week. Some jobbers altered their discounts in wiring material, probably in an effort to stimulate contractor buying, which has fallen away to almost a minimum. In each case, however, the condition was probably entirely local. Wire showed a little softening, particularly in small lots. The price of copper, however, is strengthening, and it is doubtful if some of the low prices quoted on wire this week can be maintained.

Seasonable supplies show better sales as a result of the hot wave that is engulfing the Middle West and East.

## NEW YORK

There has been practically little or no change in the New York market during the past week. Prices, with the exception of standard porcelain and a few odds and ends, were steady. There has been, of course, the usual summer slump from the regular channels of trade, but this has been made up by demands from other sources. Contractors are doing practically no buying, as building operations are at a low point. On the other hand, the industrial requirements are still large and show no abatement.

Local stocks on standard material, with the exception of fans, which moved rapidly under the spell of extreme hot weather, and perhaps a few other items, are in excellent shape under the better deliveries.

It is not improbable that buying by jobbers may fall off considerably within the next few months. A good many orders were placed earlier as protection against poor deliveries, but now that the railroads are making better time local stocks are fast filling up to the limit. Should local building continue to show a falling off, these stocks will serve for an indefinite period, and therefore higher prices seem further away.

There appears to be a tightening up on credit terms,

with greater insistence on prompt payment, especially from contractors and fixture dealers. Collections have picked up after the slump of a week or ten days ago.

**LABOR.**—The report on the labor market in New York State for June has just been made by the State Department of Labor, and shows a slight decrease in the number of employees. The water, light and power utilities increased both their number of employees and wage payment of 5 per cent in June as compared with May, thereby establishing new high records in both respects. As compared with June of last year, there were 7 per cent more workers and 13 per cent more wages.

**BELLS.**—One of the manufacturers of bells and gongs and similar house goods advanced the price on his lines during the week.

**FANS.**—The more seasonable weather of last week was reflected in local fan sales. Retailers did a very good business. Wholesale stocks are now gone with the exception of a few odds and ends. Weather reports indicate a continuation of hot weather for an indefinite period, so that it is reasonable to believe that retailers will carry little or no fan stock over the winter. There has been great difficulty in obtaining standard types of fans, while orders for special-finish fans that are coming in every day are being turned down.

**HEATING APPLIANCES.**—One large distributer received orders for nine electric mangles last week for use in large homes in the near vicinity of New York City. Ordinarily the sale of two mangles a month is considered good business. The acuteness of the servant problem in this territory is undoubtedly the controlling factor in these sales. There is a good demand for heating appliances from the government. Central stations are not buying any flatirons, but are placing some orders for toasters.

**WASHING MACHINES.**—The announcement of an advance in prices which is daily expected had not been made up to the time this was written.

**STANDARD PORCELAIN.**—A considerable advance, in the neighborhood of 15 per cent, has just been made. The advance is not uniform and depends largely upon the grade and kind of porcelain. Deliveries are becoming much better.

**WIRE.**—The market is rather uncertain. Some manufacturers are quoting lower prices, while others are holding firm. There are reports of some unloading of copper by those with large stocks, but on the whole it is just as difficult to obtain stocks as it ever was.

**CONDUIT.**—The demand from contractors owing to the falling off in building operations is not keeping up, and for this reason it seems doubtful if there will be any immediate increase in spite of certain rumors of coming advances. Local stocks are in good shape. Owing to freight embargoes on conduit on certain roads to Eastern points it is difficult to obtain supplies at present.

**ARMORED CONDUCTOR.**—There is no particular call for flexible-steel armored conductor. Large stocks were laid in some time ago, and there has been no appreciable depletion of them.

**SOCKETS AND FITTINGS.**—Local stocks are excellent and deliveries are good. There are no indications of a change in price. There have been rumors of anticipated prices, but it is doubtful if these rumors have been other than efforts to boom the market.

**AUTOMOBILE EQUIPMENT.**—The demand for electric starting and lighting equipments for medium and low-priced cars for the last thirty days has been increasing and it is believed will continue to increase, although for some time there has been a very marked slump in this market.

**CREDITS AND COLLECTIONS.**—There was a marked falling off in collections a week to ten days ago, but they are now much better and indications are that the collections for the month of July will be very heavy. Credits are getting tighter and tighter with certain classes of the trade. Less time is being given to contractors and fixture houses owing to the conditions with which these two elements of the trade have to contend. Fixture houses have experienced a very considerable falling off in business, while the contractors are faced with the slump in building operations in all but industrial lines. Contractors have also laid in large stocks of material at high prices. For these reasons these classes of the trade are not considered so good a risk as in normal times.

## CHICAGO

The question "How is business?" asked in the Chicago territory this week usually brought the answer "Slowed up a little." An investigation showed, however, that the general impression that business is slowing up is obtained through a view of comparative values. Inquiries into the business of jobbers for June showed that the sales for that month had been from 25 to 40 per cent ahead of the same month last year, the average figures for the jobbers interviewed being between 30 and 35 per cent. It is expected that July will not be so far ahead of July last year on account of the fact that last year's sales were boosted by the heavy movement of fans, while this year fan sales have been light. Furthermore, the business in the city of Chicago has been affected by labor conditions. While the opinion is not unanimous, some jobbers believe that the government's policy in connection with copper and steel purchases has caused uncertainty which made itself felt in their business. They state that the effect has been somewhat the same as would be expected during peace negotiations. At the same time, however, these jobbers are not at all in a mood to sacrifice the stock they are carrying, since they realize that the deliveries they will be able to make from stock later on in the year will permit them to render valuable service. Credits and collections remain about the same.

**INSULATED WIRE.**—Wire salesmen are having a difficult time explaining the present situation to customers. The advance in cotton yarn has more than offset the recent decrease in the price of copper, so that the price of insulated wire has increased. To illustrate how important this phase of the wire situation is, it may be pointed out that in 1000 ft. of No. 18 fixture wire the difference in cost of manufacture now, as against three months ago, is 44 cents. This is entirely due to the difference in the cost of yarn. Of course, in larger conductors the increase in proportion to total cost is not so noticeable.

**FANS.**—Fans are moving rapidly. The majority of purchases are being made by isolated plants and offices. The jobbers have noticed this tendency, and it is further borne out by the fact that department store sales have been almost nil.

**TRANSFORMERS.**—Many central stations in the Middle West have already sent lists of transformers to government authorities at Washington covering the units which they are prepared to furnish for cantonment purposes. It is understood that the government was unable to secure new transformers and has taken this means of getting the equipment promptly.

**AUTOMOBILE SUPPLIES.**—While the season as a whole has been somewhat backward, the demand for this class of goods is generally fair.

**INCANDESCENT LAMPS.**—William P. Clark, international president of the Flint Glass Workers' Union, announced at Toledo, Ohio, on July 26, that 1200 electric-bulb makers in Ohio had been granted an increase of 35 per cent in wages.

## BOSTON

No marked change in the volume of business appears among jobbers compared with a week ago, although a slight improvement in credit conditions is reported in eastern Massachusetts. Trade is rather spotty at this time, some dealers noting an increase and others slight reduction in business. A prominent Boston jobber reports that the demand for large electrical equipment holds up well and that appliances are moving more freely. The outlook for housewiring this fall appears to be very poor, with the exception of alteration jobs. Architects specializing in residential work are quiet, the high cost of labor and materials proving a discouraging factor to owners of both

cheap and expensive establishments. Shore resorts in this territory report excellent business, which is reflected in good central station earnings. More attention than ever is being given to the efficient merchandising of appliances at seaside places, especially those occupied by the well-to-do.

No specific price increases were noted this week, and in some instances prices on large jobbing orders have been shaded a trifle in order to secure the business. Labor conditions remain about as a week ago, and deliveries are practically unchanged.

A very heavy volume of business is being handled in the textile power field, motors being in great demand for both war order and private mill service. The central station is coming into its own here, unit cost of power being less of a factor than the increased value of capital for use in manufactures as compared with money invested in private plant equipment.

**LAMPS.**—Prospective central station demands are fully up to normal. The volume of business holds well and manufacturers are increasing their stocks daily. The amount of business which will be carried this fall cannot readily be forecast at this time, pending settlement of the agency-consignment question between central stations and lamp producers. Deliveries are improving and prices remain the same, in general.

**TEXTILE POWER EQUIPMENT.**—Motors are in great demand and price is a secondary consideration in this field at present. Central stations in New Bedford and Fall River, Mass., and elsewhere are coming into their own in regard to textile service. The June output of the former company exceeded that of June, 1916, by 203 per cent, and a 207 per cent increase was noted in May. The growth of power business in New Bedford, a city of about 110,000 inhabitants, has necessitated the building of a 52,000-kw. turbine plant rapidly approaching completion. In the Connecticut Valley important power developments are under way associated with textile and other service. It would be unsafe, according to good authority, to count upon unchanged textile motor prices, since these reflect manufacturing costs subject to increase.

**INDUSTRIAL ELECTRIC TRUCKS.**—Inquiries are increasing, and price changes are not in immediate prospect. Diversified sales are a feature of this business, and competition is unusually keen. Deliveries remain satisfactory, on the whole.

**FANS.**—Recent warm weather lowered stocks materially, and some jobbers are nearly cleaned out. Central stations report a brisk demand.

**IRON CONDUIT.**—The demand is strong for industrial wiring installations, and jobbers with stocks filled in advance of present requirements are still able to supply local needs to advantage. On the manufacturing side, however, the shortage of labor, raw material and transportation tells heavily against satisfactory delivery and price conditions.

**LABOR.**—Conditions are on the whole fairly good. A serious strike in the shoe industry at Lynn, Mass., is being protracted to a troublesome point, with adverse influence upon local electrical demands. A prominent jobber reports improved labor conditions. Contractors are finding conditions easier as regards labor supply.

**FIXTURES.**—Business is increasing somewhat, though little fall trade can be identified as yet. Prices remain about the same as last week.

**APPLIANCES.**—Trade continues excellent. One suburban central station outside of Boston notes a growing demand for electric ranges, even of the higher-priced types. Purchasers are emphasizing the economy of these equipments as a striking advantage under present fuel-cost conditions. Washing machines are moving well.

**TELEPHONE EQUIPMENT, ETC.**—The manufacture of telephone equipment and industrial signaling apparatus is at present stimulated by government orders. It cannot be said that prices have reached the top in view of labor and material conditions. Plants are very active.

**ELECTRIC HEATING APPARATUS.**—A heavy demand for domestic and industrial apparatus is noted. Much electric heating equipment is on order for the army and navy. Industrial products are moving freely and stocks are light. Although no price advances are scheduled, good authority looks for further increases before many months if present tendencies continue.

## ATLANTA

Building permits are far in excess of the same period a year ago, with an equivalent increase in the amounts expended. June was considerably above last year's record, and up to the present time July is doing almost as well.

The good showing in construction is exclusive of that being done at cantonments and in the fire district. Practically no building has been started in the section of Atlanta wiped out by the big fire. This is due to the fact that all labor is employed on other work. Building material prices are very high and hard to obtain. It is not probable that any extensive rehabilitation will take place until the necessary factors in construction ease up. Other construction, however, is keeping all lines busy. The jobbers are securing some good orders from quartermasters at cantonments covering material for temporary work until such time as regular shipments commence on material already on order from the large distributers.

**FIXTURES.**—There has always been a strong demand for the standard types of fixtures in this section, but the business for this year to date is away above normal. In fact, one jobber reports his sales as being 50 per cent greater than last year. The many new apartments and small residences under construction, combined with building renovations, accounts, no doubt, for the increased activity in this line. The candelabra and semi-indirect types seem to be the most popular.

**HOUSEHOLD APPLIANCES.**—The market for specialties has not been so good lately, and this is probably due to a momentary move of economy. However, the dealers have had a good week on the sale of vibrators and electric churns. Heating appliances, sewing-machine motors and vacuum cleaners are moving slowly, which is to be expected at this season of the year.

**FANS.**—The vicinity of Atlanta is experiencing cooler weather than normal, and the trade has only had about three weeks of real fan business up to date. Although the season is advancing rapidly, there is no apparent sign of discouragement as the more southerly districts and so-called "hot belt" sections are drawing on stocks steadily, which will offset deficiencies for the northern portion. It is expected, therefore, that the business as a whole will be equal to last year.

**INSULATORS.**—The construction of new and re-insulating of existing transmission lines by the power companies of the Southeast has created a heavy demand on the insulator manufacturers during the period in which they have had labor difficulties. Prices have advanced 100 per cent over last year, and deliveries for this vicinity show no improvement.

## ST. LOUIS

There has been very little change in the electrical commercial situation in this territory during the last week. Collections are possibly a little better and orders continue to hold up. On the whole, the outlook for good crops in this vicinity is splendid, which augurs well for prosperity in the agricultural districts in the fall.

Although a large amount of material is being purchased for the United States army cantonments and encampments now building at Little Rock, Ark., Belleville, Ill., and Fort Sill and Fort Worth, Tex., not a great deal of this material is being taken from St. Louis stocks. As has been before noted in these columns, the orders have to a large extent been placed direct with the manufacturers, who have for the most part been shipping direct to the point of installation. However, some material bought from some of the big concerns in New York is being sent to the encampments from the manufacturers' St. Louis stocks or from those of local jobbers.

The local manufacturers still complain of the tremendous difficulty in obtaining raw materials, principally those

of iron, such as castings and sheets. Prices for iron materials are excessive. In fact, in some instances plans for future manufacture have been held in abeyance on account of the high nominal prices which are now being quoted for these metals. Certain executives are holding off buying at the present prices.

In Wichita conditions are about the same. Some other lines are suffering a decrease, but the electrical line continues to hold up. At Dallas, Tex., and Memphis, Tenn., business in general is above normal with no indications of an immediate let-up. One jobbing house in St. Joseph, Mo., reports that its business is the best it has had in years.

**WIRING SUPPLIES.**—Conditions are practically the same as outlined in last week's report. Conduit and conduit fittings are still giving considerable worry because of inability to obtain them. One instance has been reported where some iron conduit fittings ordered last April have not yet been delivered.

**FANS.**—Fans are still moving but very slowly. However, the temperatures have during the past week been much higher on the average in this territory, which will doubtless accelerate sales.

**POLES.**—Poles are scarce and promise to be scarcer. Prices are up and doubtless will go higher.

**CROSS-ARMS.**—An advance has been scheduled for Aug. 1. No definite information can be had as to the amount of the promised advance. Some local jobbers will not now quote on orders other than those which they can fill from their existing stocks. The coming advance is apparently due to labor difficulties and to the great demand for timber for government and other purposes.

**INCANDESCENT LAMPS.**—The situation remains about the same as last week. There is a tendency in some quarters to discount the prediction that was made last week that there might be a scarcity of lamps in the fall.

**ELECTRIC MINING EQUIPMENT.**—An order for electric locomotives and motors totaling in the neighborhood of $50,000 was placed in this territory recently.

**FARM-LIGHTING OUTFITS.**—The demand is not great during the summer months, but the jobbers and manufacturers are preparing for a big business later in the season. It is believed that, owing to the advertising effects of the exhibits which will be used at the county fairs this fall and to the general prosperity of the farmers, the aggregate sales will be very satisfactory.

## SAN FRANCISCO

Conditions have changed only slightly since last week. However, in spite of the fact that there has been little building activity, contractors and dealers are still meeting obligations promptly. Industrial business remains good. Several large government orders for cantonment supplies have been booked this week and shipbuilding continues to be an important factor in the trade of the month. July and August are the slack months in California on account of weather and vacations, particularly in the city of San Francisco, and it is not predicted that there will be much change in the general conditions for some weeks.

**FANS.**—There is still a great demand for fans, and the continued hot weather in the central valleys indicates that this will continue much later than usual. Deliveries are still very poor.

**WIRE.**—Rubber-covered wire is active and stocks are good. Price is steady.

**POLE HARDWARE.**—Condition of stock in pole hardware is improving on account of better deliveries, and the demand in this line is very brisk.

**LAMPS.**—The lamp situation remains serious, with no prospect of change.

**SWITCHES.**—Safety switches are in great demand, probably because of inspection by the Industrial Accident Commission, which is enforcing its safety rules; but this business is hard to handle on account of slow deliveries. Knife switches in all sizes are in great demand, but deliveries are so poor that the business cannot be well handled.

## SEATTLE

Business along all lines in the Northwest is chaotic on account of prevailing strikes and threatening walk-outs. No particular change is noticed in electrical stock conditions over last week, while buying continues to be conservative. Appliance business is holding up well owing to constant activities of large central stations. although there was a slight decrease during the week in comparison with the week previous. Large building is at a minimum and small building is very slack. This applies to every city in the Northwest with the exception of Spokane, which shows a slight increase in the volume of business of larger dealers. July business was about the same as for the same period last year, with the number of customers cut almost in half. The shipyard business is the mainstay of Northwest dealers. Owing to decreased movements of lumber to Eastern markets, the railways serving the Northwest are enjoying a period of car surplus and arrangements are under way by which idle equipment may be stored on sidetracks of subsidiary lines. Traffic men believe that within a few weeks, when farm crops move to market, surplus cars will be in demand. Slowing up in lumber shipping is attributed to decreased production caused by strikes in a majority of the mills and logging camps. Credits and collections are fair. Dealers report considerable falling off of demand for motors, lighting equipment and electrical equipment in sawmills.

**CONDUIT.**—Conduit prices are unchanged, but indications are that there will be further advances in the near future.

**LINE MATERIAL.**—The demand is falling off slightly. Increase in price is noted.

**APPLIANCES.**—The demand for electric ranges shows steady improvement. Irons show satisfactory volume of sales.

**FIXTURES.**—Fixtures are rather quiet. The fall trade has not begun to materialize.

**MOTORS.**—Demand for motors for industrial shops and shipyards far outstrips supply. Shipments on these are extremely hard to obtain.

**LAMPS.**—There is a satisfactory summer business. Prices remain about the same.

**WIRING DEVICES.**—Movement on wiring devices remains firm and jobbers are fulfilling orders.

## METALS MARKETS CONDITIONS

### Copper Quotations Show Marked Strengthening on Shortage Rumors

Copper quotations became much stronger during last week on rumors of a threatened shortage due to the strikes at the mines. Wire base, however, showed a further softening. Aluminum dropped off considerably last week.

Nominal quotations on electrolytic copper on Monday were as follows: August, 28.25 cents; September, 27.75 cents; October, 27.25 cents; fourth quarter, 26.75 cents.

**NEW YORK METAL MARKET PRICES**

| | July 23 | July 30 |
|---|---|---|
| | £ s d | £ s d |
| Copper: | | |
| London, standard spot | 130 0 0 | 125 0 0 |
| Prime Lake | 28.00 to 29.00* | 29.50 to 30.00* |
| Electrolytic | 26.25 to 26.75* | 28.00 to 28.50* |
| Casting | 25.00 to 25.50* | 26.50 to 27.00* |
| Wire base | 35.00 to 36.00* | 33.00 to 33.50* |
| Lead, trust price | 11.00 | 11.00 |
| Nickel, ingot | 50.00 | 50.00 |
| Sheet zinc, f.o.b. smelter | 19.00 | 19.00 |
| Spelter, spot | 8.55 to 8.67½ | 8.55 to 8.67½ |
| Tin, Straits | 62.50 | 63.60 |
| Aluminum, 98 to 99 per cent. | 51.00 to 53.00* | 46.00 to 48.00* |

**OLD METALS**

| | | |
|---|---|---|
| Heavy copper and wire | 25.50 to 26.00 | 24.00 to 24.50 |
| Brass, heavy | 15.00 to 15.50 | 15.00 to 15.50 |
| Brass, light | 12.50 to 13.00 | 12.50 to 13.00 |
| Lead, heavy | 8.75 to 9.25 | 8.75 to 9.00 |
| Zinc, old scrap | 6.00 to 6.25 | 6.25 to 6.50 |

*Nominal.

# Current Prices of Electrical Supplies

## NEW YORK AND CHICAGO QUOTATIONS

The prices quoted are those prevailing in standard package or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists to contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

The variation in prices may be due to the difference in grade of products made by different manufacturers, to local conditions or to both.

### ARMORED CONDUCTORS, FLEXIBLE STEEL

*Single-Conductor*

| B. & S. Size | List, per 1000 Ft. |
|---|---|
| No. 14 solid | $61.00 |
| No. 12 solid | 71.00 |
| No. 10 solid | 90.00 |
| No. 8 solid | 106.00 |
| No. 6 solid | 145.00 |
| No. 10 stranded | 95.00 |
| No. 8 stranded | 115.00 |
| No. 6 stranded | 160.00 |
| No. 4 stranded | 205.00 |
| No. 2 stranded | 266.00 |
| No. 1 stranded | 315.00 |

*Twin-Conductor*

| | |
|---|---|
| No. 14 solid | 104.00 |
| No. 12 solid | 135.00 |
| No. 10 solid | 185.00 |
| No. 8 stranded | 235.00 |
| No. 6 stranded | 370.00 |
| No. 4 stranded | 575.00 |

### NET PRICE PER 1000 FT.—NEW YORK

*Single-Conductor*

| | |
|---|---|
| No. 14 solid: | |
| Less than coil | $54.90 to $67.10 |
| Coil to 1000 ft | 48.80 to 59.17 |
| No. 12 solid: | |
| Less than coil | 63.90 to 78.10 |
| Coil to 1000 ft | 56.80 to 68.87 |

*Twin-Conductor*

| | |
|---|---|
| No. 14 solid: | |
| Less than coil | $78.00 to $114.40 |
| Coil to 1000 ft | 75.00 to 93.60 |
| No. 12 solid: | |
| Less than coil | 121.50 to 148.50 |
| Coil to 1000 ft | 108.00 to 130.95 |

### DISCOUNT—CHICAGO

*Single-Conductor*

| | |
|---|---|
| Less than coil | +10% |
| Coil to 1000 ft | 10% |

*Twin-Conductor*

| | |
|---|---|
| Less than coil | +10% |
| Coil to 1000 ft | 10% |

### ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

### DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg | 12% to +20% |
| 1/5 to std. pkg | 20% to Net |
| Std. pkg. | 30% to 44% |

### DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg | 12% to —20% |
| 1/5 to std. pkg | 20% to Net |
| Std pkg. | 30% to 44% |

### BATTERIES, DRY

NEW YORK

| Each Net | No. 6 Regular | No. 6 Ignitor |
|---|---|---|
| Less than 12 | $0.40 | $0.40 |
| 12 to 50 | .35 | .35 |
| 50 to barrel | .31 | .32 |
| Barrel lots | .28 | .29 |

### BATTERIES, DRY—Continued

CHICAGO

| Each Net | No. 6 Regular | No. 6 Ignitor |
|---|---|---|
| Less than 12 | $0.40 | $0.40 |
| 12 to 30 | .35 | .35 |
| 50 to barrel | .31 to .31¾ | .32 to .32¾ |
| Barrel lots | .28¾ | .29¾ |

### CONDUIT, METALLIC FLEXIBLE

| Size, In. | Ft. per Coil | List per 100 Ft. |
|---|---|---|
| 5/16 | 250 | $5.00 |
| ⅜ | 250 | 7.50 |
| ½ | 100 | 10.00 |
| ¾ | 50 | 13.00 |
| 1 | 50 | 21.00 |
| 1¼ | 50 | 26.00 |
| 1½ | 25–50 | 35.00 |
| 2 | 25–50 | 45.00 |
| 2½ | 25–50 | 52.00 |

### NET PER 1000 FT.—NEW YORK

| | Less than Coil | Coil to 1000 Ft. |
|---|---|---|
| ⅝-in. single strip | $67.50 to $75.00 | $60.00 to $69.75 |
| ⅝-in. double strip | 73.75 to 75.00 | 66.25 to 72.00 |
| ½-in. single strip | 90.00 to 100.00 | 80.00 to 93.00 |
| ½-in. double strip | 95.00 to 100.00 | 85.00 to 96.00 |

### NET PER 1000 FT.—CHICAGO

| | Less than Coil | Coil to 1000 Ft. |
|---|---|---|
| ⅝-in. single strip | $71.25 to $75.00 | $60.00 to $63.75 |
| ⅝-in. double strip | 75.00 to 78.75 | 67.50 to 71.25 |
| ½-in. single strip | 95.00 to 100.00 | 80.00 to 85.00 |
| ½-in. double strip | 100.00 to 105.00 | 90.00 to 95.00 |

### CONDUIT, NON-METALLIC FLEXIBLE

| Size, In. | List, per Foot | Size, In. | List, per Foot |
|---|---|---|---|
| 7/32 | $0.05½ | 1 | $0.25 |
| ¼ | .06 | 1¼ | .33 |
| ⅜ | .09 | 1½ | .40 |
| ½ | .12 | 1¾ | .47 |
| ⅝ | .15 | 2 | .55 |
| ¾ | .18 | 2¼ | .65 |

### NET PER 1000 FT.—NEW YORK

| | Less Than $15 List | $15 to $60 List | $60 to $150 List |
|---|---|---|---|
| 7/32-in.— | $55.00 | $24.50-$25.50 | $21.50-$24.75 |
| ¼-in.— | $40.00-$60.00 | $27.00-$30.00 | $23.50-$27.00 |

### NET PER 1000 FT.—CHICAGO

| | Less Than $15 List | $15 to $60 List | $60 to $150 List |
|---|---|---|---|
| 7/32-in.— | $55.00 | $27.50 | $23.10-$24.75 |
| ¼-in.— | $60.00 | $30.00 | $25.20-$27.00 |

### CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

*Card No. 38*

| Size, In. | Conduit, List per Foot |
|---|---|
| ¼ | $0.08½ |
| ⅜ | .08½ |
| ½ | .08½ |
| ¾ | .11½ |
| 1 | .17 |
| 1¼ | .23 |
| 1½ | .27½ |
| 2 | .37 |
| 2½ | .58½ |
| 3 | .76½ |

| | Couplings, List | Elbows, List |
|---|---|---|
| ¼ | $0.05 | $0.19 |
| ⅜ | .06 | .19 |
| ½ | .07 | .19 |
| ¾ | .10 | .25 |
| 1 | .13 | .37 |
| 1¼ | .17 | .45 |
| 1½ | .21 | .60 |
| 2 | .28 | 1.10 |
| 2½ | .40 | 1.80 |
| 3 | .60 | 4.80 |

### DISCOUNT—NEW YORK

| | ¼ In. to ½ In. | ¾ In. to 3 In. |
|---|---|---|
| Less than 2500 lb. | 3.8% to 8% | 5.8% to 10% |
| 2500 to 5000 lb. | 6.8% to 11% | 8.8% to 13% |

(For galvanized deduct six points from above discounts.)

### DISCOUNT—CHICAGO

| | ¼ In. to ½ In. | ¾ In. to 3 In. |
|---|---|---|
| Less than 2500 lb. | 5.8% to 8% | 7.8% to 10% |
| 25.00-5000 lb. | 8.8% to 11% | 10.8% to 13% |

(For galvanized deduct six points from above discounts.)

### FLATIRONS

NEW YORK

| | |
|---|---|
| Net | $3.15 to $4.20 |

CHICAGO

| | |
|---|---|
| Net | $3.15 to $3.85 |

### FUSES, INCLOSED

| 250-Volt | Std. Pkg. | List |
|---|---|---|
| 3-amp. to 30-amp. | 100 | $0.25 |
| 35-amp. to 60-amp. | 100 | .35 |
| 65-amp. to 100-amp. | 50 | .90 |
| 110-amp. to 200-amp. | 25 | 2.00 |
| 225-amp. to 400-amp. | 25 | 3.60 |
| 450-amp. to 600-amp. | 10 | 5.50 |
| 600-Volt | | |
| 3-amp. to 30-amp. | 100 | $0.40 |
| 35-amp. to 60-amp. | 100 | .60 |
| 65-amp. to 100-amp. | 50 | 1.50 |
| 110-amp. to 200-amp. | 25 | 2.50 |
| 225-amp. to 400-amp. | 25 | 5.50 |
| 450-amp. to 600-amp. | 10 | 8.00 |

### DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg | 28% |
| 1/5 to std. pkg | 38% |

### DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg | 28% |
| 1/5 to std. pkg | 38% to 39% |

### FUSE PLUGS

*3-Amp. to 30-Amp.*

NEW YORK

| | Per 100 Net |
|---|---|
| Less than 1/5 std. pkg. | $5.75 to $6.30 |
| 1/5 to std. pkg. | 4.50 to 5.25 |

Standard package, 500. List, each, $0.07.

CHICAGO

| | Per 100 Net |
|---|---|
| Less than 1/5 std. pkg. | $6.25 |
| 1/5 to std. pkg. | 5.25 |

Standard package, 500. List, each, $0.07.

### LAMPS, MAZDA

*105 to 125 Volts*

| Regular, clear: | Std. Pkg. | List, Each |
|---|---|---|
| 10 to 40-watt—B | 100 | $0.27 |
| 60-watt—B | 100 | .36 |
| 100-watt—B | 24 | .65 |
| 75-watt—C | 50 | .65 |
| 100-watt—C | 24 | 1.00 |
| 200-watt—C | 24 | 2.00 |
| 300-watt—C | 24 | 3.00 |
| Round bulb, 3⅛ in., frosted: | | |
| 15-watt—G 25 | 50 | .50 |
| 25-watt—G 25 | 50 | .50 |
| 40-watt—G 25 | 50 | .50 |
| Round bulbs, 3¾ in., frosted: | | |
| 60-watt—G 30 | 24 | .72 |
| Round bulbs, 4⅝ in., frosted: | | |
| 100-watt—G 35 | 24 | 1.05 |

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than std. pkg. | Net |
| Std. pkg. | 20% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than std. pg. | Net |
| Std. pkg. | 10% |

### LAMP CORD

*Cotton-Covered, Type C, No. 18*

NEW YORK

| | Per 1000 Ft. Net |
|---|---|
| Less than coil (250 ft.) | $30.00 to $37.84 |
| Coil to 1000 ft. | 21.00 to 28.38 |

CHICAGO

| | Per 1000 Ft. Net |
|---|---|
| Less than coil (250 ft.) | $37.20 to $38.16 |
| Coil to 1000 ft. | 27.90 to 28.62 |

### LAMP GUARDS, WIRE

Standard packages from 50 to 150.

NEW YORK

| | |
|---|---|
| Net per 100 | $18.00 to $30.00 |

CHICAGO

| | |
|---|---|
| Net per 100 | $13.33 to $30.00 |

### OUTLET BOXES

| Nos. | List, per 100 |
|---|---|
| 101—A, A1½, 4 S.C., 6200, 320 | $30.00 |
| 102—B.A., 6200 S.E., 300, A.X. 1½, 4 S. | 30.00 |
| 103—C.A., 9, 4 R, B 1½ | 25.00 |
| 106—F.A., 7, C.S. 1½, 3 R. | 20.00 |

DISCOUNT—NEW YORK

| | Black | Galvanized |
|---|---|---|
| Less than $10.00 list | List to 40% | 42% to 50% |
| $10.00 to $50.00 list | List to 35% | 37% to 45% |

DISCOUNT—CHICAGO

| | Black | Galvanized |
|---|---|---|
| Less than $10.00 list | 40% | 35% |
| $10.00 to $50.00 list | 50% | 45% |

### PIPE FITTINGS

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg. | 10% |
| 1/5 to std. pkg. | 20% |
| Std. pkg. | 30% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg. | 10% |
| 1/5 to std. pkg. | 20% |
| Std. pkg. | 30% |

### PORCELAIN CLEATS—UNGLAZED

*2 and 3 Wire*

NEW YORK

| | Per 1000 Net |
|---|---|
| Less than 1/5 std. wire | $14.00 to $18.00 |
| 1/5 to std. pkg. | 13.00 |

Standard package, 2200. List per 1000, $20.

CHICAGO

| | Per 1000 Net |
|---|---|
| Less than 1/5 std. pkg. | $14.00 to $18.20 |
| 1/5 to std. pkg. | 13.00 to 16.90 |

Standard package, 2200. List per 1000, $20.

### PORCELAIN KNOBS

NEW YORK

| | 5½ N.C.—Solid Nail-it—N.C. | |
|---|---|---|
| Per 1000 Net | Std. Pkg. 3500 | Std. Pkg 4000 |
| Less than 1/5 std. pkg. | $18.50 to $24.30 | $20.75 to $28.00 |
| 1/5 to std. pkg. | 9.00 to 12.15 | 16.30 to 21.50 |

CHICAGO

| | 5½ NC.—Solid Nail-it—N.C. | |
|---|---|---|
| Per 1000 Net | Std. Pkg. 3500 | Std. Pkg. 4000 |
| Less than 1/5 std. pkg. | $10.20 to $10.50 | $28.00 |
| 1/5 to std. pkg. | 9.60 to 9.75 | 21.50 |

### SOCKETS AND RECEPTACLES

| | Std. Pk. | List |
|---|---|---|
| ⅛-in. cap key and push sockets | 500 | $0.33 |
| ⅛-in. cap keyless socket | 500 | .30 |
| ⅛-in. cap pull socket | 250 | .60 |

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg. | Net |
| 1/5 to std. pkg. | 15% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg. | Net |
| 1/5 to std. pkg. | 15% |

### SWITCHES, KNIFE

*250-Volt, Front Connections, No Fuse*

| High Grade: | List |
|---|---|
| 30-amp. S. P. S. T. | $0.80 |
| 60-amp. S. P. S. T. | 1.20 |
| 100-amp. S. P. S. T. | 2.25 |
| 200-amp. S. P. S. T. | 3.48 |
| 300-amp. S. P. S. T. | 5.34 |
| 30-amp. D. P. S. T. | 1.20 |
| 60-amp. D. P. S. T. | 1.78 |
| 100-amp. D. P. S. T. | 3.38 |
| 200-amp. D. P. S. T. | 5.20 |
| 300-amp. D. P. S. T. | 8.00 |
| 30-amp. 3 P. S. T. | 1.80 |
| 60-amp. 3 P. S. T. | 2.68 |
| 100-amp. 3 P. S. T. | 5.08 |
| 200-amp. 3 P. S. T. | 7.80 |
| 300-amp. 3 P. S. T. | 12.00 |
| Low Grade: | |
| 30-amp. S. P. S. T. | 0.42 |
| 60-amp. S. P. S. T. | 0.74 |
| 100-amp. S. P. S. T. | 1.50 |
| 200-amp. S. P. S. T. | 2.70 |
| 30-amp. D. P. S. T. | 0.68 |
| 60-amp. D. P. S. T. | 1.22 |
| 100-amp. D. P. S. T. | 2.50 |
| 200-amp. D. P. S. T. | 4.50 |
| 30-amp. 3 P. S. T. | 1.02 |
| 60-amp. 3 P. S. T. | 1.84 |
| 100-amp. 3 P. S. T. | 3.76 |
| 200-amp. 3 P. S. T. | 6.76 |

DISCOUNT—NEW YORK

| High Grade: | |
|---|---|
| Less than $10 list | +5% to list |
| $10 to $25 list | 11% |
| $25 to $50 list | 14% |
| Low Grade: | |
| Less than $10.00 list | 5% |
| $10.00 to $25.00 list | 16% |
| $25.00 to $50.00 list | 24% |

DISCOUNT—CHICAGO

| High Grade: | |
|---|---|
| Less than $10 list | +5% |
| $10 to $25 list | 11% |
| $25 to $50 list | 14% |
| Low Grade: | |
| Less than $10.00 list | 5% |
| $10.00 to $25.00 list | 16% |
| $25.00 to $50.00 | 24% |

### SWITCHES, SNAP AND FLUSH

*5-Amp. and 10-Amp., 125-Volt Snap Switches*

| | Std. Pkg. | List |
|---|---|---|
| 5-amp. single-pole | 250 | $0.28 |
| 5-amp. single-pole ind. | 250 | .32 |
| 10-amp. single-pole | 100 | .48 |
| 10-amp. single-pole, ind. | 100 | .54 |
| 5-amp., three-point | 100 | .56 |
| 10-amp., three-point | 50 | .76 |
| 10-amp., 250-volt, D. P. | 100 | .66 |

### SWITCHES, SNAP AND FLUSH—Cont'd

*10-Amp. 250-Volt Push-Button Switches*

| | Std. Pkg. | List |
|---|---|---|
| 10-amp. single-pole | 100 | $0.45 |
| 10-amp. three-way | 50 | .70 |
| 10-amp. double-pole | 50 | .70 |

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg. | Net to —20% |
| 1/5 to std. pkg. | 15% to Net |
| Std. pkg. | 28% to 30% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg. | Net to —20% |
| 1/5 to std. pkg. | 15% to Net |
| Std. pkg. | 30% |

### SWITCH BOXES, SECTIONAL CONDUIT

| Union and Similar | List, Each |
|---|---|
| No. 155 | $0.34 |
| No. 160 | .60 |

DISCOUNT—NEW YORK

| | Black | Galvanized |
|---|---|---|
| Less than $2.00 list | List to 25% | 15% to 18% |
| $2.00 to $10.00 list | 23% to 25% | 15% to 18% |
| $10.00 to $50.00 list | 23% to 35% | 18% to 25% |

DISCOUNT—CHICAGO

| | Black | Galvanized |
|---|---|---|
| Less than $2.00 list | 40% to 50% | 30% to 40% |
| $2.00 to $10.00 list | 50% | 40% |
| $10.00 to $50.00 list | 64% | 52% |

### TOASTERS, UPRIGHT

NEW YORK

| | |
|---|---|
| Net price | $3.15 to $3.50 |

CHICAGO

| | |
|---|---|
| Net price | $2.80 to $3.50 |

### WIRE, ANNUNCIATOR

NET PRICE—NEW YORK

| | |
|---|---|
| No. 18, less than full spools | $0.52 to $0.65 |
| No. 18, full spools | 0.48 to 0.55 |

CHICAGO

| | Per Lb. Net |
|---|---|
| No. 18, less than full spools | $0.65 to $0.6885 |
| No. 18, full spools | 0.5285 to 0.56 |

### WIRE, RUBBER-COVERED, N. C.

*Solid-Conductor, Single-Braid*

NEW YORK

| | Price per 1000 Ft. Net | | |
|---|---|---|---|
| No. | Less than 500 Ft. | 500 to 1000 Ft. | 1000 to 5000 Ft. |
| 14 | $15.00-18.00 | $12.00-16.00 | $11.50-14.00 |
| 12 | 19.89-21.06 | 18.96-25.62 | 18.01-21.35 |
| 10 | 29.60-41.51 | 26.64-35.58 | 25.31-29.65 |
| 8 | 42.40-60.13 | 38.16-51.50 | 36.25-42.95 |
| 6 | 72.19-89.57 | 64.98-76.80 | 60.50-61.73 |

CHICAGO

| | Price per 1000 Ft. Net | | |
|---|---|---|---|
| No. | Less than 500 Ft. | 500 to 1000 Ft. | 1000 to 5000 Ft. |
| 14 | $18.00 | $16.00 | $14.00 |
| 12 | 25.99-29.89 | 21.96-25.62 | 20.13-23.48 |
| 10 | 36.49-42.28 | 30.84-36.24 | 28.27-33.22 |
| 8 | 51.54-51.83 | 43.80-47.25 | 40.15-47.25 |
| 6 | 74.80-81.93 | 68.00-69.40 | 56.54-61.20 |

### WIRE, WEATHER-PROOF

*Solid-Conductor, Triple-Braid, Sizes 4/0 to 8 Inc.*

NEW YORK

| | Per 100 Lb. Net |
|---|---|
| Less than 25 lb. | $40.25 to $45.00 |
| 25 to 50 lb. | 39.25 to 44.00 |
| 50 to 100 lb. | 38.00 to 43.00 |

CHICAGO

| | Per 100 Lb. Net |
|---|---|
| Less than 25 lb. | $38.35 to $45.35 |
| 25 to 50 lb. | 37.35 to 44.35 |
| 50 to 100 lb. | 36.35 to 43.35 |

# NEW APPARATUS AND APPLIANCES

*A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field*

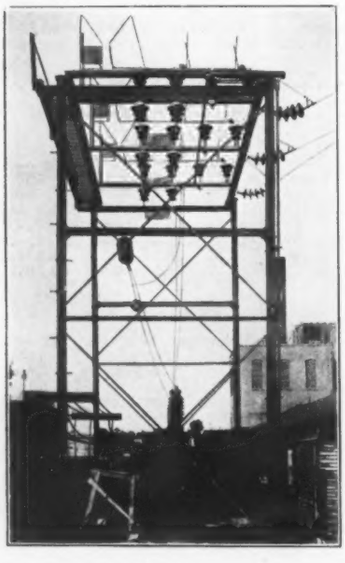
## Porcelain Pendent Switch

The General Electric Company of Schenectady, N. Y., has designed a new all-porcelain pendent switch for use in installations where the switch is exposed to dampness and other corroding influences. The pendent switch is small and compact, yet very strong and rugged. The operating mechanism is quick make and break and is rated at 3 amp., 250 volts, and 6 amp., 125 volts. The porcelain shell is in two parts.

PENDENT SWITCH FOR DAMP PLACES

## Cotton Mill Outdoor Substation

Under present fuel conditions cotton mill managers are beginning to realize that it is to their advantage to purchase central station power. The large volume of business being handled is taxing isolated plants. Fortunately many cotton mill districts are quite accessible to transmission lines, and a good example of central station supply through a standard outdoor substation is shown. In this particular installation the transformer capacity is 450 kva., primary voltage 44,000, secondary 600. High-cost switching and protective equipment is absent, the entire high-tension control being of the modern type, employing air-brake switches, high-speed sphere gap, graded-resistance type lightning arresters, carbon-tetrachloride fuses, and long-term cylinder-form choke coils.

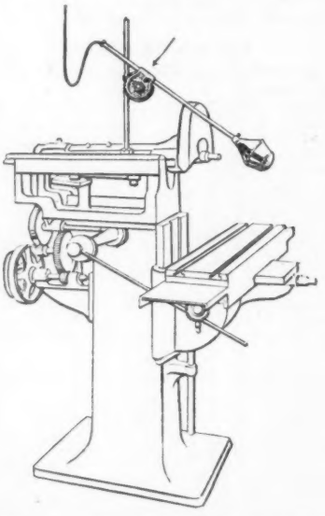


OUTDOOR SUBSTATION FOR INDUSTRIAL LOADS

Central stations by means of the outdoor substation will now secure many industrial loads which could not be taken on with the conventional type of high-cost indoor substation. This station is made by the Delta-Star Electric Company of Chicago

## Adjustable Lamp Holders

W. N. Matthews & Brother, St. Louis, Mo., have placed on the market a fitting which consists simply of a universal joint that permits a lamp fixture clamped to it to be held in any position in which it is moved. The Matthews company is marketing only that part which contains the adjustable feature and is not selling lighting fixtures with it. The device is made of 20-gage pressed steel. The friction plates are held together by a brass rivet, and it is said the tension of the plates will take care of practically all conditions where any adjustable fixture will be needed. It is made to fit standard ⅜-in. (9.5-mm.) conduit, galvaduct and sheraduct and the standard ⅜-in. (9.5-mm.) black iron pipe and ⅝-in. (15.9-mm.) rod, which are usually in stock. With the adjustable device and the equipment an industrial plant already has it is possible to make all individual lamps adjustable.



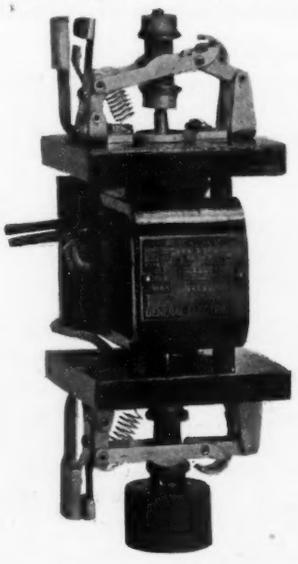
ADJUSTABLE DEVICE APPLIED TO FIXTURE ON A MILLING MACHINE

## Relay for Electrically Operated Breakers

The General Electric Company, Schenectady, N. Y., has developed a "trip-free relay" to prevent electrically (solenoid or motor) operated breakers from being held closed on overload. It accomplishes the same purpose as a trip-free mechanism on hand-operated breakers; that is, it prevents the breaker from being held in on overload or short circuit. This is accomplished by the addition of the trip-free relay to the usual control apparatus.

If the breakers are solenoid-operated, the lower coil of the trip-free relay is connected in parallel with the trip coil of the breaker, but with motor-operated breakers the lower coil is connected in series with the trip-coil circuit.

If the breaker is closed when there is an overload on the line, the overload relay energizes the lower coil of the trip-free relay and the plunger which operates both sets of contacts is raised. The opening of the upper contacts disconnects the closing coil of the solenoid or motor-operated breaker. At the same time the breaker opens and remains open until the pull-button control switch is opened, since after the lower contacts of the trip-free relay are closed they are sealed closed by the upper coil of the relay until the control switch has been opened.

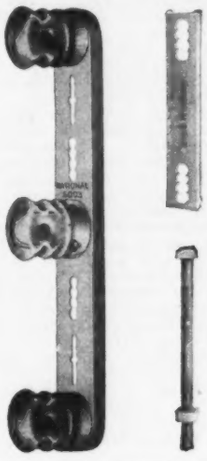


TRIP-FREE RELAY

When the trip-free coils are not energized the contacts fall by gravity into the normal operating position. These relays are mounted usually near the breaker or behind the switchboard.

## Three-Point Brackets for Service Connections

Slight changes in the design of the three-point bracket made by the National Metal Molding Company of Pittsburgh, Pa., have recently been made. The bracket in question is known as No. 5003. Through the provision of

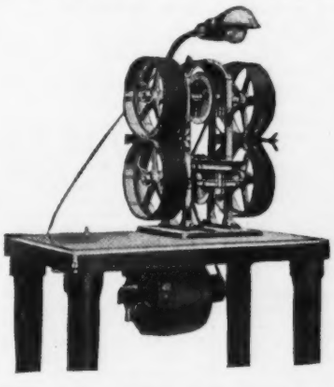


THREE-POINT BRACKET AND PARTS

slots, as shown in the accompanying illustration, and similar slots in straps No. 5040, in conjunction with bolts No. 5051, this bracket may be used as either a two-point or three-point break arm. The slots allow for the varying sizes of cross-arms or for the application of the brackets in either vertical or horizontal position. With a stock of one, two or three point brackets, corner chairs, break-arm straps and bolts, it is claimed that practically any service connection can be made.

## Electrically Operated Razor-Blade Sharpener

The razor-blade sharpener made by the A. E. Hill Manufacturing Company, Atlanta, Ga., sharpens the blade on the same principle that has always been used in sharpening the old-style razor



SMALL MOTOR RUNS THIS SHARPENER

by hand. The only difference is that with this machine the hone and strops are rotated instead of moving the razor over them. The hone is in the form of a flat disk, which rotates in a horizontal plane, and the strops are mounted on wheels, which run in vertical planes. A special holder fits every style of blade.

A lamp bracket is mounted on the head of the machine so as to throw a good light directly upon the work. The stropping wheels and hone are belt-driven from a 1/10-hp. Robbins & Myers motor.

## Spot-Lighting the Automobile Flag

An electric lamp for illuminating a radiator flag, and which may also be used as a portable inspection lamp, is being marketed by the Flaglite Sales Corporation, 1790 Broadway, New York City. The outfit includes a silk flag, a silver-plated parabolic reflector and a rubber-finished rolled-steel bracket. By means of the clamp the miniature floodlamp can be attached to the filler stem of the automobile radiator in a few seconds.

## Electric Tea Cart

D. C. Lamb & Company of Ottawa, Ill., has placed several styles of electrical tea wagons on the market. A feature of this line of electrical furniture is the adjustable table reel under the tray rack which takes care of the

ELECTRICAL TEA WAGON WITH TWO OUTLETS

attachment cord. This reel operates like a window shade and permits any convenient length of cord up to 16 ft. (4.9 m.) to be unrolled or rolled up at will. There are two 660-volt outlets at the sides of the table for attaching the appliance plugs. The wagons are being supplied in mahogany, oak and walnut. Practically all styles measure 17 in. (43.2 cm.) wide by 27 in. (68.6 cm.) long by 29 in. (73.7 cm.) high. The receptacles and attachment plug were supplied by Harvey Hubbell, Inc.

## Industrial Truck

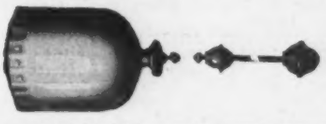
The Enterprise Machine Works, 115 West Redondo Street, Los Angeles, Cal., have developed an electric tractor which is equipped with a high-speed four-pole motor running on Hess-Bright ball bearings. The motor is mounted on the yoke over the tractor wheels and is geared thereto. Three speeds are obtained by cutting out the field coils, using a speed controller consisting of a single-switch blade conveyed into three switch jaws. The control of the motor can also be secured automatically by the foot brake. As standard equipment a fourteen-cell, fifteen-plate battery is used, either Gould, Exide or Philadelphia make. The battery is supported low under the truck and suspended on coil springs that absorb any bumps the truck may be subjected to. The brakes are foot-operated, with electric current cut-off, affecting 2-in. (5.08-cm.) contracting

TRUCK HAS TURNING RADIUS WITHIN ITS TOTAL LENGTH

brake bands on each rear wheel. The wheelbase of a standard floor truck is 66 in. (167.6 cm.), and that of the tractor 40 in. (101.6 cm.). The tread is 37 in. (94 cm.). Steering is accomplished by mounting directly to the steering head a large-sized automobile steering wheel. The steering head revolves in a Timken roller bearing and has two projecting arms terminating with small ball-bearing wheels running on a circular track to withstand rough roadbed operating. The weight of the truck is 1500 lb. (680 kg.). The turning radius, it is said, is absolutely within the total length of the truck.

## Two-Circuit Service Electrolier Pull Switches

Switches for two-circuit service-making electrolier connections have been added to the "new-wrinkle line" of the Bryant Electric Company of Bridgeport, Conn. These switches have been furnished heretofore, however, only in the single-pole construction. Successive pulls of the operating chain will light respectively the lamps on circuits "1," "2," "1 and 2" and "off." This switch can be used with any of the forty-one caps and bases of the standard "new-wrinkle line," being interchangeable with any of the other "new-wrinkle" bodies. A knurled lock



INTERCHANGEABLE-SERVICE PULL SWITCH

nut turned up on the shoulder fastens the switch securely in position. These switches are all National Electrical Code standard and have an approved rating of 3 amp., 125 volts, or 1 amp., 250 volts.

## Trade Notes

W. N. MATTHEWS & BRO., INC., has moved its Chicago office from 507 South Clinton Street, where it has been for the past sixteen years, to Room 400, Lees Building, 19 South Fifth Avenue.

F. H. JAMESON, for a number of years a member of the selling force of the Ohio Brass Company and more recently associated with the Electric Service Supplies Company, died at his home in Chicago on July 10.

EDGAR N. DOLLIN, organizer and president of the Acme Die-Casting Corporation, has sold his holdings in that company and is retiring from active management. Mr. Dollin was formerly secretary of the Doehler Die-Casting Co.

THE CALEBAUGH SELF-LUBRICATING CARBON CO., Philadelphia, announces that, owing to an enormous increase in business, its plant will hereafter be at 1508-1518 Columbia Avenue. The offices will still remain at 1503 Columbia Avenue.

THE PHILLIPS WIRE COMPANY, Pawtucket, R. I., announces that the business operated as the Phillips Insulated Wire Company will hereafter be conducted under the name Phillips Wire Company. This is a change in corporate name only. The location of the business, policy and management will be the same as heretofore.

THE ACME DIE-CASTING CORPORATION of Brooklyn, N. Y., has issued a statement saying that the suit recently brought against it by the Doehler Die-Casting Company for infringement of patent No. 1,156,093 does not in any way affect the product or present business of the Acme Die-Casting Corporation, as it covers a process not now in use.

STEPHEN GARDNER, for thirteen years connected with the sales office of the Westinghouse Electric & Manufacturing Company, has resigned to accept a position with the Greenlee interests of Chicago. Mr. Gardner entered the electrical business in 1896 in the employ of the Commonwealth Edison Company. In recent years he has been handling the business of the Insull properties for the Westinghouse company. In his new position he will be secretary of the Northwestern Stove Repair Company, treasurer of the Northwestern Foundry Company and treasurer of the Greenlee Foundry Company.

## New Incorporations

THE ASHTABULA (Ohio) Electric COMPANY has been incorporated with a capital stock of $15,000 by R. A. Wentz, W. H. Murbach, E. H. Wentz and others.

THE RELIANCE ELECTRIC COMPANY of Norfolk, Va., has been incorporated with a capital stock of $50,000. The officers are: F. W. Sharp, president and W. J. Cannon, secretary.

THE PORTAGE LIGHT, HEAT & POWER COMPANY of Cleveland, Ohio, has been chartered with a capital stock of $50,000 by R. H. Jamison, H. A. Hauxhurst, R. Hall, W. R. Daley and J. H. Kellogg.

THE GIBSONBURG (Ohio) ELECTRIC LIGHT COMPANY has been chartered with a capital stock of $40,000 by A. H. Miller, N. B. Ervin, C. B. Snyder, W. J. Mead, F. W. Zorn, G. W. Hornung and F. C. Hornung.

THE LA FRENCH POWER SPARK PLUG COMPANY of Dayton, Ohio, has been chartered with a capital stock of $100,000 by F. A. Eastman, Harry N. Eastman, Arthur A. Nixon, Harvey C. Garber and I. A. Lytle.

THE HEREZ LIGHT SUPPLY COMPANY of Philadelphia, Pa., has been incorporated with a capital stock of $25,000 to manufacture gas and electric fixtures. Samuel Strausmann, 1523 Poplar Street, is the principal incorporator.

THE O. K. STORAGE BATTERY COMPANY of Oklahoma City, Okla., has been chartered with a capital stock of $100,000 by A. F. Fricks, Earl Rueb and C. F. Wilson. The company proposes to manufacture storage batteries.

THE MILNOR ELECTRIC COMPANY of Cincinnati, Ohio, has been incorporated with a capital stock of $40,000 to manufacture machinery. The incorporators are: L. T. Milnor, J. P. Milnor, H. T. Ritchie, H. B. Machoy and M. Jaquish.

THE W. B. PERRY ELECTRIC COMPANY of Brooklyn, N. Y., has been incorporated by William B. Perry, Victor V. Shorey and G. Burchard Smith. The company is capitalized at $75,000 and proposes to do a general electrical engineering business.

THE MARITIME ELECTRIC COMPANY of Fredericton, N. B., has been incorporated with a capital stock of $1,000,000 to construct and operate electric-light and power plants. The incorporators are: John J. F. Winslow, John J. McCaffrey, Ernest A. McKay and others.

THE HOBBS STORAGE BATTERY COMPANY of Los Angeles, Cal., has been incorporated by A. A. Hobbs, A. W. Bumiller, S. M. Haskins and H. V. Andrews. The company is capitalized at $100,000 and proposes to manufacture storage batteries and other electrical equipment.

THE MIDLAND ELECTRIC STEEL COMPANY of Chicago, Ill., has been chartered with a capital stock of $10,000 by Joseph S. Samuels, Stanley Filip and R. I. Davis. Equipment, it is reported, will be supplied by the Booth-Hall Company of Chicago, Ill., recently organized.

COLE & MORGAN of Caldwell, N. J., have filed articles of incorporation with a capital stock of $5,000 for the purpose of doing a mechanical and electrical engineering business. The incorporators are: A. B. Cole of Caldwell, N. J.; A. P. Morgan and A. G. Morgan of Montclair, N. J.

THE LONG ISLAND WRECKING & REPAIR CORPORATION of Elmhurst, N. Y., has been chartered with a capital stock of $5,000 by W. S. and F. M. Basore and A. C. Douglas of Elmhurst. The company proposes to do a general mechanical and electrical engineering business.

THE POWER DEVELOPMENT COMPANY of Montreal, Que., Canada, has been incorporated by Gerald A. Coughlin, Francis G. Bush, George R. Drennan and others. The company is capitalized at $500,000 and proposes to generate and distribute electricity for lamps, heaters and motors.

THE CLINCHFIELD (Tenn.) HYDRO-ELECTRIC POWER COMPANY has been incorporated with a capital stock of $50,000 by John A. Thompson, E. K. Baldwin, M. P. Beasley, L. D. Carmack and C. D. Jarvis. The company proposes to develop water power and establish a hydroelectric plant.

THE GLOBE ENGINEERING COMPANY of Hamilton, Ont., Canada, has been incorporated with a capital stock of $100,000 to take over the plants and holdings of the Globe Electric Machine Company. The incorporators are: Ivor Lewis, William F. Coote, Russell W. Treleaven and others.

THE CLEMENS ELECTRICAL CORPORATION OF CANADA of Hamilton, Ont., Canada, has been chartered with a capital stock of $50,000 to manufacture electrical appliances, machinery, etc. The incorporators are: Henry N. Kittson, Alexander Metherell, William D. Dailey and others.

SCHROCK & SQUIRES of New York, N. Y., have filed articles of incorporation with the Secretary of State for the purpose of doing a general electrical engineering business, manufacturing iron, steel and copper products. The incorporators are: J. J. O'Connor, F. W. Bain and W. B. Nealis, 291 Pearl Street, New York, N. Y.

THE H. A. BAUER COMPANY of Landsdowne, Pa., has been chartered by H. A. Bauer, 22 Lansdowne Avenue, Lansdowne; Guy F. Bauer, 219 South Farragut Terrace, and James H. Bell, 1815 Land Title Building, Philadelphia. The company is capitalized at $30,000 and proposes to manufacture gas and electrical fixtures and supplies.

THE SOUTHWESTERN UTILITIES COMPANY of Alva, Okla., has been incorporated by Albert Manuel, president of the Kansas Electric Utilities Company, Dayton, Ohio, and Noel R. Cascho and W. A. Parr of Alva, Okla. The company is capitalized at $500,000 and proposes to construct and operate street railway and lighting properties in numerous Oklahoma cities and towns.

CHARLES V. HOFFMAN, INC., has filed articles of incorporation under the laws of the State of New Jersey with a capital stock of $25,000. The company proposes to build and sell power plants and electrical and other machinery. The incorporators are: Charles V. Hoffman of Bound Brook, N. J.; Louis L. Browne of Newburgh, N. Y.; Everet B. Hendrickson of Ridgewood, N. J., and others. The office of the company is located at 239 Washington Street, Jersey City, N. J. Herbert C. Gilson is agent.

## Trade Publications

REFLECTORS.—The National X-Ray Reflector Company of Chicago has issued a leaflet, serial No. 161, entitled "It's Never Too Late."

STEAM TRAPS.—The Farnsworth Company, Conshohocken, Pa., is distributing a book descriptive of Farnsworth tilting steam traps.

RHEOSTATS.—The Central Scientific Company, 460 East Ohio Street, Chicago, is distributing bulletin No. 19, descriptive of its laboratory rheostat.

"TELEFAULT."—W. N. Matthews & Bro., Inc., of St. Louis, Mo., is distributing a mailer descriptive of its Woodpecker "Telefault" for locating trouble.

AUTOMATIC CONTROL.—The General Electric Company of Schenectady, N. Y., is distributing a leaflet descriptive of automatic control for small direct-current motors

HEATERS.—Hotpoint "Hedlite" heaters are illustrated and described in a folder now being distributed by the Hotpoint Electric Heating Company of Ontario, Cal.

RAILWAY ENGINEERING DATA.—The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has prepared a bulletin on railway engineering data.

LOCOMOTIVES. — Internal-combustion locomotives are illustrated and described in record No. 85, now being distributed by the Baldwin Locomotive Works of Philadelphia, Pa.

MOTOR-GENERATOR SETS.—Bulletin No. 181, superseding bulletin No. 156, describing motor-generator sets for all purposes, has been prepared by the Crocker-Wheeler Company of Ampere, N. J.

SAFETY DEVICES.—The V. V. Fittings Company, 1910 North Sixth Street, Philadelphia, has prepared a forty-page catalog covering new types of V. V. fittings, safety devices and vapor-proof fittings. The bulletin is carefully illustrated, listed and indexed.

HOISTING MACHINERY.—The Shepard Electric Crane & Hoist Company, Montour Falls, N. Y., has prepared a pamphlet on hoisting machinery for industrial works. Hoists for various purposes are described and supplemented with illustrations giving valuable dimensional data.

CAR LIGHTING.—The Electric Storage Battery Company of Philadelphia has prepared a bulletin on the chloride accumulator for car lighting. This company has also prepared a bulletin on the "Exide" battery for starting, lighting and ignition service. A parts price list is given in this book.

SOLVAY ALKALI.—The Solvay Process Company, Syracuse, N. Y., has prepared a new edition of its blue book entitled "Solvay Alkali." This book deals with the various forms and uses of alkali and contains notes on the alkali industry and various chemical and commercial tables useful for the consumers.

ELECTRIC PLANT.—The Main Electric Manufacturing Company of Pittsburgh, Pa., has prepared bulletin No. 80, which is a report of the Carnegie Institute of Technology. This report includes information regarding a series of tests performed upon a 750-watt generator made by the Main Electric Manufacturing Company.

PROJECTORS.—The Crouse-Hinds Company of Syracuse, N. Y., has prepared bulletin No. 303, descriptive of its new Imperial floodlight projector. The feature of this bulletin is that it also lists, in addition to the established line, 1000-watt projectors in types and arrangements for both marine and land use. The bulletin also contains illumination and lamp statistics of value.

HYDROELECTRIC AND STEAM POWER PLANTS.—Viele, Blackwell & Buck, consulting engineers and constructors, 49 Wall Street, New York City, have prepared a bulletin descriptive of the engineering and construction work which this firm has carried on. Photographs are shown of various plants in the United States, Canada and Mexico. The bulletin is well prepared and handsomely illustrated.

STORAGE BATTERIES.—Bulletin 600, descriptive of Edison storage batteries for industrial transportation, has been prepared by the Edison Storage Battery Company of Orange, N. J. Many uses of the electrical tractors using Edison storage batteries are illustrated and described in this book. General data and trade dimensions of Edison storage batteries for industrial purposes, practice, storage-battery locomotives, etc., are also given.

## New England States

BROCKTON, MASS.—The contract for electrical work for the new ward for the Brockton Hospital has been awarded to the Tremaine Electric Company at $2,200.

FRANKLIN, MASS.—The Union Light & Power Company has petitioned the Gas and Electric Light Commissioners for permission to issue $163,000 additional capital stock, the proceeds to be used for extensions to its plant and service.

GLOUCESTER, MASS.—The Board of Aldermen has adopted an ordinance authorizing the Gloucester Electric Company to install 41 incandescent lamps of 400 cp. mounted on iron poles on Main Street from Elm to Washington Street.

PITTSFIELD, MASS.—The contract for building an extension to the power station of the Pittsfield Electric Company has been awarded to the Stone & Webster Engineering Corporation, 147 Milk Street, Boston. Power equipment, it is understood, has not yet been purchased.

SOMERVILLE, MASS.—Plans have been adopted by the Board of Aldermen for the rearrangement of the street lamps on College Avenue, Elm Street and Highland Avenue near Davis Square and on Broadway from the Boston line to Marshall Street, and providing for suitable lamps to be erected on short ornamental standards.

STOCKBRIDGE, MASS.—C. D. Parker & Company of Boston, Mass., who control and operate the Lee (Mass.) Electric Company and Great Barrington (Mass.) Electric Light Company, have purchased the property of the Stockbridge Lighting Company. The three companies are to be operated on a co-operative basis.

## Middle Atlantic States

BROOKLYN, N. Y.—The Edison Electric Illuminating Company has awarded a contract for extensions and improvements to its Sixty-sixth Street power plant, to cost about $15,000. M. R. Jahnke, 360 Pearl Street, is architect.

MONROE, N. Y.—The Orange & Rockland Electric Company has recently closed a contract with W. A. Harriman to furnish electricity for lamps and motors for the Arden estate and the Sterling mines for a period of ten years. The company has recently purchased the property of the Buttermilk Falls Electric Company at Highland Falls and the Bear Mountain Inn, and will eventually light Palisades entire.

OLEAN, N. Y.—Arrangements are being made by the Olean Electric Light & Power Company for extensions and improvements to its system, including the erection of a two-circuit transmission line from the Olean power station, one circuit to extend to Salamanca, the other to Bradford. The company will also install a 3500-hp., 60-cycle steam turbine, which will double the output of its plant. Contracts have been awarded for the work.

NEWTON FALLS, N. Y.—The Newton Falls Paper Company is contemplating the construction of a hydroelectric plant, to cost about $50,000. Charles E. Easton, Sherman Building, Watertown, is engineer.

NEW YORK MILLS, N. Y.—A petition has been filed with A. L. Murdock, town clerk, by the taxpayers requesting the Town Board to establish a new lighting district in a portion of the town not now covered by lighting district No. 1.

CALDWELL, N. J.—The contract for the erection of an addition to the power plant at the county penitentiary has been awarded by the County Commissioners to William G. Sharwell, 377 North Fifth Street, Newark, at $75,000.

CHELSEA, N. J.—John Stafford of Philadelphia, Pa., has awarded a contract for a power and heating system for his hotel, to be erected on the beach front, to Lewis Wanner, 1723 Ludlow Street, Philadelphia, at $185,000.

GLOUCESTER CITY, N. J.—The City Council has awarded a contract to the Public Service Electric Company for lighting the streets of the city for a period of five years. A new street-lighting system consisting of 109 lamps of 600 cp., 40 lamps of 100 cp. and 73 lamps of 32 cp., making a total of 222 lamps, will be installed.

KEYPORT, N. J.—The installation of a new fire-alarm system is under consideration by the Borough Council.

ORANGE, N. J.—Negotiations are under way between the Merchants' Association and the City Commissioners for the installation of new street lamps on Main Street. Extensions to the street-lighting system, it is said, will require an increase in the generating capacity of the municipal electric-lighting plant.

# *Construction*

**News of Projects, Plans, Bids and Contracts. Notes on Work Under Way**

POMPTON LAKES, N. J.—By the acquisition of a water power site on Pompton Lake the Borough Council plans to abolish the present steam-driven pumping station at the municipal water-works plant and to install a hydroelectric plant, the initial installation to cost about $35,000. The proposed new plant will supply electricity for lamps and motors for municipal service.

FORT MIFFLIN, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 13 for construction of chief gunners' quarters, including heating, electric wiring, etc., at the naval ammunition depot at Fort Mifflin. Drawings and specifications (No. 2486) may be obtained on application to the bureau or the commandant of the navy yard at Philadelphia.

LEBANON, PA.—The Lebanon Valley Electric Light Company has contracted with the Lebanon Valley Iron & Steel Company to supply energy for a 500-kw. converter in the steel plant of the latter.

PHILADELPHIA, PA.—A new boiler plant, one story, to cost about $10,000, will be erected at the Girard Point works of the Pennsylvania Railroad Company.

READING, PA.—The Metropolitan Electric Company has entered into a contract to supply 300 hp. to operate the plant of the Whitehall Manufacturing Company.

BALTIMORE, MD.—Application has been made for a permit to build a one-story power house on Oak Street, between Twenty-third and Twenty-fourth Streets, for Goucher College. The building will be 40 ft. by 64 ft. and will cost about $9,600. Ellicott & Emmart are architects. Contract has not yet been awarded.

WHEELING, W. VA.—Work has been started on the construction of a new power plant for the La Belle Tin Works, to replace the old plant, which is inadequate. A large generator will be installed to provide temporary power to operate the works until the station is completed.

NORFOLK, VA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 13, for furnishing and installing eight electric hoists, monorail tracks, supports, switches, turntables and trolley rails in the new foundry at the navy yard, Norfolk, Va. Drawings and specifications (No. 2481) may be obtained on application to the above bureau or the commandant of the navy yard named.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 15, for supplying to the various public buildings under the control of the Treasury Department hand, electric, portable vacuum cleaners during the fiscal year ending June 30, 1918. For details see Searchlight Section.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for equipment at the various navy yards and naval stations as follows: South Charleston, W. Va., Schedule 1378—Five motor-driven, head-geared, 12-in. lathes, five head-geared, 24-in. engine-driven lathes, two constant-speed drive milling machines, one electrically-driven planing machine, two motor-driven, vertical milling machines, one 100-in. vertical boring and trimming mill, one motor-driven, three-spindle drill press, two 6½-in. electrically-driven vertical shapers. Philadelphia, Pa., Schedule 1377—One motor-driven, 24-in. bevel-geared planer. Portsmouth, N. H., Schedule 1367—325 fire-control telephone jacks. Various, Schedule 1367—Miscellaneous type B, water-tight annunciators, miscellaneous water and non-water-tight vibrating bells, miscellaneous pear push buttons, miscellaneous portable firing salvo buzzers, 4400 rubber ear cushions, 136 magneto testing generators, 800 non-water-tight telephone plugs, 120 portable telephone testing sets, miscellaneous portable ventilating sets, 550 fire-control telephones, miscellaneous ship's service telephones. Applications for proposal blanks should designate the schedule desired by number.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: F.o.b. works, Schedule 1390, finders, range and transmission systems, 36 each; Pearl Harbor, H. T., Schedule 1379, one motor-driven centrifugal pump, two gasoline motor cars. Boston, Mass., Schedule 1391, 133,000 double tubular connectors; Schedule 1376, 7000 ft. 3 and 4-conductor interior communication cable, 500 ft. armored controller searchlight cable. Schedule 1374, miscellaneous twisted pair telephone cable; miscellaneous rubber-insulated lighting and power wire. Various, Schedule 1375, 130,000 ft. insulated antenna wire; Schedule 1376, miscellaneous rubber-insulated, single lighting and power wire; miscellaneous flexible brush holder cable, miscellaneous single-cord, ignition cable, miscellaneous rubber-insulated interior communication cable, miscellaneous plain, armored and leaded telephone cable, miscellaneous silk-covered bell cord, 220,000 ft. fire control telephone cord, miscellaneous incandescent lamp cord, 472,000 ft. plain bell wire, miscellaneous single, plain and armored, twin-conductor and flexible single-conductor light and power wire, miscellaneous cotton and silk-covered flat magnet wire. Portsmouth and Boston, Schedule 1374, 70,000 cu. ft. double-cord, ship lighting cable. Mare Island, Cal., Schedule 1374, 200 lb. annunciator wire. Charleston, S. C., Schedule 1374, 5000 ft. solid fixture wire. Norfolk, Va., Schedule 1374, 6000 ft. rubber-insulated pothead wire. Boston and Charleston, Schedule 1374, miscellaneous rubber-insulated telephone wire. Application for proposal blanks should designate the schedule desired by number.

## North Central States

GLADSTONE, MICH.—The Marble Arms & Manufacturing Company is planning to build a plant to manufacture motors and generators.

LOUISVILLE, KY.—The Roy C. Whayne Supply Company of Louisville is reported to be in the market for a locomotive crane, two or more traveling cranes, steam or electric, to handle 1¼ cu. yd. to 1½ cu. yd. orange-peel buckets at 25 ft.; also two stiff-leg traveling derricks, 75-ft. boom, capable of operating a 4-cu. yd. clamshell bucket; two 1¼ or 1½-yd. orange-peel buckets, and two 4-cu. yd. clamshell buckets.

LAPORTE, IND.—The electric plant of the Laporte Gas & Electric Company was destroyed during a severe windstorm on July 23.

BROCKTON, ILL.—The installation of a municipal electric-light plant in Brockton is under consideration. The village authorities would like to receive from manufacturers catalogs of complete plants or separate apparatus. Preliminary information will be furnished for making estimates. For further information address P. V. Deames.

HARTFORD, WIS.—Bids will be received by the city of Hartford until Aug. 7 for furnishing 40 cast-iron ornamental standards, including globes and film sockets for lamps of 100 cp.

ADAMS, MINN.—The Western Electric Company has secured the contract for the installation of an ornamental lighting system in Adams.

DULUTH, MINN.—The City Council has granted the Duluth Street Railway Company permission to erect two feed wires of 500,000 cm. capacity each in a double cable over the Aerial Bridge across the Duluth ship canal to connect with the circuit of the Park Point Traction Company, which was recently taken over by the Duluth Street Railway Company. After connections are made the power plant of the Park Point Traction Company will be used only in emergencies.

GRAND RAPIDS, MINN.—Bids will be received by the Commissioners of Itasca County, Court House, Grand Rapids, until Aug. 13 for construction of a fireproof hospital, including general construction, heating, electric work, elevator, hospital, laundry and kitchen equipment. Bids will be received on the entire work and separately. Plans and specifications may be obtained at the office of F. H. Mosse & Company, architects, Rochester, Minn., upon deposit of $10.

KASSON, MINN.—Bids will be received by the Village Council until Aug. 10 for construction of municipal building, including general construction, plumbing, heating and electric wiring. Plans and specifications are on file at the office of Purcell & Elmskie, Auditorium Building, Minneapolis, Minn., and People's Gas Building, Chicago, Ill., and at the office of the recorder in Kasson.

ST. CLOUD, MINN.—Bids will be received by the State Board of Control, State Capitol, St. Paul, until Aug. 14, for the complete rock-crushing plant and equipment for the Minnesota Reformatory at St. Cloud. The Charles L. Pillsbury Company of St. Paul and Minneapolis is engineer.

ST. CLOUD, MINN.—Bids will be received by the State Board of Control, State Capitol, St. Paul, until Aug. 14, for complete installation of mechanical equipment of quarters "E," Minnesota State Reformatory, at St. Cloud. The Charles L. Pillsbury Company of St. Paul and Minneapolis, is engineer.

WILLMAR, MINN.—Bids will be received by the Minnesota State Board of Control, State Capitol, St. Paul, until Aug. 14 for the following work at the State Hospital at Willmar: Construction of cottages 1 and 2 for men, addition to laundry building, addition to power plant, addition to slaughter house, alterations to service building, new sidewalks and tunnel ventilators and refrigerators, including heating and ventilating, plumbing and electrical work. Plans and specifications may be seen at the office of the Board of Control, at the office of C. H. Johnston, architect, St. Paul, and the St. Paul, Minneapolis and Duluth Builders' Exchanges.

FORT MADISON, IOWA.—Bids will be received at the office of C. T. Hull, county auditor, Fort Madison, until Aug. 7 for construction of drainage pumping station as follows: (1) For furnishing material and construction of pumping station and appurtenances; (2) furnishing and installing two 42-in. centrifugal pumps; (3) two 300-hp. motors, including transformers and auxiliary apparatus; (4) wiring and electric control devices; (5) piping and valves; (6) furnishing material and labor for pumping and for the heating and water supply installation; (7) furnishing and installing a priming device; (8) a 10-ton traveling crane; (9) furnishing and installing hydraulic instruments for measuring the head and capacity of same. Plans and specifications may be obtained from the Edmund T. Perkins Engineering Company, 1210 First National Bank Building, Chicago, Ill., and Illinois State Bank Building, Quincy, Ill., and C. T. Hull, county auditor, Fort Madison, upon deposit of $20.

MONDAMIN, IOWA.—Bonds to the amount of $12,000 have been voted for the installation of an electric-light and power plant.

FARGO, N. D.—The contract for the construction of the main building and power plant of the Equity Packing Company has been awarded to T. P. Powers & Company at $186,700. The main building will be 84 ft. by 215 ft., four stories and basement, and the power house 61 ft. by 85 ft.

BONESTEEL, S. D.—Bonds to the amount of $15,000 have been voted for the installation of an electric-light plant.

VERMILION, S. D.—Bids will be received at the office of the president of the State University at Vermilion until Aug. 21 for construction of an engineering building and women's building for the State University. Separate bids to be submitted for heating, wiring and plumbing. Plans and specifications may be seen at the office of Holmes & Flinn, Chicago, Ill., and Sioux Falls, S. D.

RIVERTON, NEB.—Bonds have been authorized for the installation of an electric-light plant in Riverton.

KANSAS CITY, KAN.—The City Commissioners have granted the Standard Electric Light Company permission to furnish electricity to light the Central Avenue Bridge.

## Southern States

CHARLOTTE, N. C.—The Southern Power Company is contemplating extending its electric transmission lines to Greenville, S. C., at a cost of about $30,000.

GREENSBORO, N. C.—Bids will be received by the Commissioners of Guilford County, Greensboro, until Aug. 21 for construction, including heating, elevator and plumbing and jail equipment, for court house and jail building to be erected in Greensboro. An appropriation of $250,000 has been voted for the work. Plans and specifications may be obtained on application to Harry Barton of Greensboro, architect, upon deposit of $25.

HIGH POINT, N. C.—The City Council is considering the question of installing an electric generating plant to maintain the municipal lighting system. Energy is now purchased from the North Carolina Public Service Company of Greensboro.

COLUMBIA, TENN.—The plant of the Columbia Water & Light Company was badly damaged by an explosion on July 20. A new engine and generator will be ordered at once.

MOBILE, ALA.—The Mobile Electric Company is contemplating extending its electric transmission lines to Blakely and Pinto Islands to supply electricity to various industrial properties in those places. The cost of the extension is estimated at $20,000.

BATESVILLE, ARK.—The City Council has authorized an appropriation of $25,000 for improvements to the electric-light and water-works systems.

RUSSELLVILLE, ARK.—The Arkansas Light & Power Company is making improvements to its local plant, including the installation of a 1000-hp. turbo-generator.

MANGUM, OKLA.—The City Council has closed a contract for equipment to double the capacity of the municipal electric-light plant, at a cost of about $50,000. The plans provide for the installation of two oil-burning engines, one 150 hp. and the other 200 hp. The cost of the equipment is estimated at $33,300, and the pole lines and distributing system at from $10,000 to $15,000.

MIAMI, OKLA.—The Triangle Mines Company, recently organized, with a capital stock of $50,000, to develop lead and zinc mines, is contemplating the construction of three mills to have a daily capacity of 300 tons. The plans provide for a central power plant to operate all mills. Oil engines will probably be used. N. C. Barry is president.

NEWKIRK, OKLA.—The local electric plant was recently destroyed by a tornado.

BEAUMONT, TEX.—The Beaumont Shipbuilding & Drydock Company, recently incorporated with a capital stock of $300,000, proposes to construct a shipbuilding plant on Island Park. The plans provide for the erection of a mill building, 250 ft. by 60 ft., several smaller buildings and a power house 40 ft. by 25 ft. Within a few months the company will build a drydock. C. O. Oakum is vice-president and general manager.

HOUSTON, TEX.—The Houston Light & Power Company has secured a contract to supply energy of 400 hp. to the local plant of the Texas Chemical Company, a subsidiary of the Stauffer Chemical Company. Arrangements have also been made by the Houston company to furnish from 200 to 400 kw. to the Texas Portland Cement Company in Houston.

## Pacific and Mountain States

COLVILLE, WASH.—The Commissioners of Stevens County have granted the Stevens County Power & Light Company a franchise to erect a high-tension transmission line from Chewelah to Browns Lake. The company will furnish energy to operate the tramway and the machinery in the plant of the Northwest Magnesite Company.

INDEX, WASH.—Surveys have been completed by G. N. Miller, engineer, Burke Building, Seattle, for the installation of the proposed new lighting system in Index, at a cost of about $12,000.

KEYPORT, WASH.—The contract for the installation of a 200-kw. steam plant for a government radio station in Keyport has been awarded to Charles C. Moore & Company, Mutual Life Building, Seattle.

PASCO, WASH.—The Pacific Power & Light Company will begin work at once on the construction of a new central switching station for its new 66,000-volt system to be installed in Pasco.

PORT ANGELES, WASH.—The Olympic Power Company has recently secured a contract to furnish 4000 kw. to operate a paper mill under construction here.

PROSSER, WASH.—The Pacific Power & Light Company has petitioned the Commissioners of Benton County for a franchise and right of way for the construction and operation of electric transmission lines in and near Prosser. V. L. Lewis is local manager.

SEATTLE, WASH.—J. F. Duthie & Company, shipbuilders, have been awarded a contract by the French government for two 8800-ton steel ships, to cost about $3,500,000. The vessels will be equipped with 3000-hp. turbine engines.

SEATTLE, WASH.—The date for opening bids for the construction and delivery of a complete hydroelectric light and power plant has been extended from Aug. 3 to Aug. 20 by the Board of Public Works. The original date for opening the bids was July 20.

SPOKANE, WASH.—Steps have been taken by the Civic Club for the installation of a new street-lighting system from the north end of the Monroe Street Bridge to Mallon Avenue.

WHITE BLUFFS, WASH.—The Pacific Power & Light Company has recently secured a contract to furnish electricity to operate the city pumping plant. The contract provides for the removal of the company's distributing system from the main streets to the alleys. Other improvements to the local lighting system, it is understood, will be made.

ASTORIA, ORE.—The Port Commission has recently awarded the contract for installing electrical equipment for Port of Astoria coal bunkers to the Ewart Electric Company of Astoria. The commission is considering making arrangements with the Pacific Power & Light Company to supply energy (1000 hp.) to meet the needs of the Port of Astoria docks.

PENDLETON, ORE.—The installation of a new street-lighting system and the removal of the poles and electric wires from Main Street are contemplated by the Pacific Power & Light Company. The cost of the system is estimated at from $7,000 to $8,000.

LOS ANGELES, CAL.—Plans have been filed by the Llewellyn Iron Works, 1100-1218 North Main Street, for the construction of an addition to its works, 50 ft. by 100 ft., and a power house, 35 ft. by 80 ft. The company manufactures elevators, tanks and structural steel.

LOS ANGELES, CAL.—The general contract for the construction of the reinforced concrete power house to serve the new mercantile buildings now being erected on West Seventh Street has been awarded to the Davidson Construction Company. The building will be 40 ft. by 95 ft., with chimney 150 ft. high. Dodds & Richards are architects.

MARIPOSA, CAL.—A franchise has been granted the San Joaquin Light & Power Company of Fresno to supply electricity in Mariposa.

VALLEJO, CAL.—The Vallejo Light & Power Company has been granted permission to erect and operate electric transmission lines in Solano County.

KIMBERLY, IDAHO.—A certificate of public convenience and necessity has been granted to the Idaho Power Company for the installation of an electric-lighting system in the town of Kimberly.

WALLACE, IDAHO.—The Shoshone County Power Company has petitioned the Public Utilities Commission for permission to extend its electric transmission lines from Wallace to Murray, where it proposes to furnish energy for 10 miles of placer mining claims, owned by the Yukon Gold Company, which is owned by the Guggenheim interests.

## Canada

NEW WESTMINSTER, B. C.—The Westminster Power Company has applied to the comptroller of water rights for approval of plans of the project to be constructed for the diversion of water from the Mesliloet River, Young Creek, Brant Creek, Norton Creek, Hixon Creek, Barnes Lake, Lake Anne, Norton Lake, Joseph Lake and Young Lake. The company proposes to supply electricity for lamps and motors within the districts of New Westminster, and Vancouver, including more than 20 municipalities.

PORT MANN, B. C.—The Canadian Northern Railway Company is building car shops in Port Mann and work of installing machinery is under way. Electricity for operating the plant and lighting the shop will be generated at the company's plant.

BEETON, ONT.—The engineers of the Hydro-Electric Commission of Ontario estimate that it would cost $15,000 to erect an electric transmission line to and install a lighting system in Beeton.

## Miscellaneous

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Aug. 8, for furnishing two centrifugal pumps, engine-driven, galvanized chain, railing fittings, brass whistles, brazing specter, cable, motor, transformer, rotary switches, condulets, cable grips, etc. For further information relating to circular (No. 2142) address Major I. Brown, general purchasing officer.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Aug. 15 for furnishing rods, steel rails, switch stands, electric cable, brass tubing, fusible plugs, refrigerating apparatus, etc. Blanks and information relating to this circular (1157) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York City; Audubon Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

HONOLULU, T. H.—Congress has appropriated $80,000 for lighting the entrance and entire channel of Pearl Harbor. Bids will be asked for as soon as plans have been completed and approved.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, Arthur Kneisel, 29 South LaSalle St., Chicago, Ill.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Annual convention, Pittsburgh, Oct. 3-6.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF TESTING MATERIALS. Secretary-treasurer, Edgar Marburg University of Pennsylvania, Philadelphia.

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ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, McKeesport, Pa. Annual convention, Philadelphia, Sept. 10-14.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, W. L. Connelly, Gibson, Ind.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary-treasurer, E. Brettell, Electric Supply Company, Ltd., Vancouver, B. C.

CALIFORNIA ASSOCIATION OF CONTRACTORS AND DEALERS. Secretary, James W. Redpath, 505 Rialto Bldg., San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION, affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, Excelsior Life Building, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer. T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION N. E. L. A. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

EASTERN NEW YORK SECTION, N. E. L. A. Assistant secretary, J. L. Hemphill, General Electric Company, Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF CONNECTICUT. Secretary, George M. Chapman, Waterbury, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, J. C. Staff, 578 Jackson St., Milwaukee, Wis.

ELECTRICAL DEALERS AND CONTRACTORS' ASSOCIATION OF ONTARIO. Secretary, E. A. Drury, 45 Murray St., Toronto, Can.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert E. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Affiliated with the N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

## *Directory of Electrical Associations*

**Printed in the First Issue of Each Month**

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GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, L. W. Morrow, Norman, Okla.

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ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, L. B. Van Nuys, Central Electric Co., Peoria, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburg, Ill.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre. 28 Victoria St., Westminster, London, S. W., England.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

IOWA SECTION, N. E. L. A. Secretary-treasurer, L. E. Caldwell, Iowa City, Iowa.

JOVIAN ORDER. Jupiter (president), Henry L. Doherty, New York City; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual convention, October.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer. W. W. Austin, Cottonwood Falls, Kan.

KENTUCKY ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Herbert E. Ottenheimer, Louisville, Ky.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, I. G. Marks, 323 Chartres Street, New Orleans, La.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Augusta, Me.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, Detroit Edison Co., Monroe, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, H. E. Young, Minneapolis General Electric Company, Minneapolis, Minn.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N. Minneapolis, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, W. F. Wheeler, Hattiesburg, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, H. C. Brown, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, October, 1917.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Bldg., Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 15 State St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Building, Portland, Ore.

PACIFIC COAST SECTION, N. E. L. A. Secretary, A. H. Halloran, Crossley Bldg., San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION. State Section N. E. L. A. Secretary, H. M. Stine, 211 Locust St., Harrisburg, Pa.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, Thomas J. Styles, 152 Beech St., Yonkers, N. Y.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTH DAKOTA ELECTRIC POWER ASSOCIATION. Secretary, A. H. Savage, 1114 Pioneer Building, St. Paul, Minn.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, Thomas E. Peters, Columbus, Ga.

SOUTHERN CALIFORNIA ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, H. C. Bower, 602 Metropolitan Bldg., Los Angeles, Cal.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 403-4 Slaughter Bldg., Dallas, Tex.

SOUTHWESTERN SOCIETY OF ENGINEERS. Secretary, Forrest E. Baker, 721 First National Bank Building, El Paso, Tex.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, J. H. Ashley, Fort Worth, Tex.

TRI-STATE WATER AND LIGHT ASSOCIATION. Secretary-treasurer, W. P. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. N. Layfield, 1735 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

1,233,296. HIGH-TENSION INSULATOR; Arthur O. Austin, Barberton, Ohio. App. filed May 19, 1913. Suspension or pin type.

1,233,339. CHAIN GUIDE FOR PULL SOCKETS; David D. Gordon, Chicago, Ill. App. filed Nov. 21, 1916. Means for attaching chain guides to pull sockets.

1,233,346. CONTROL SYSTEM; Arthur J. Hall, Wilkinsburg, Pa. App. filed May 25, 1914. Control of phase converters such as are employed for converting alternating-current single-phase energy into polyphase energy.

1,233,353. DYNAMO-ELECTRIC MACHINE; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed March 23, 1914. Improvement.

1,233,354. DYNAMO-ELECTRIC MACHINE; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed March 30, 1914. Special reference to alternating-current motors of the commutator type.

1,233,363. APPARATUS FOR ELECTROLYTICALLY RECOVERING METALS; George A. James, San Francisco, Cal. App. filed Oct. 14, 1916. Relates to an improved apparatus for recovering metals, particularly precious metals, from comminuted material containing the same.

1,233,364. ELECTRIC SWITCH; Oscar Johnson, Chicago, Ill. App. filed July 5, 1913. Means for controlling electrically propelled vehicles such as street and interurban cars.

1,233,370. CONTROL FOR ELECTRICAL SYSTEMS; Charles F. Kettering, Dayton, Ohio. App. filed Nov. 11, 1912. Movable element buoyantly supported within a container, but having no permanent or positive connection therewith, which is automatically actuated to vary the resistance relative to a given electrical condition or circuit.

1,233,395. ELECTRIC HOT PLATE OR HEAT UNIT; James C. Patten, Kokomo, Ind. App. filed Aug. 30, 1915. Improvements.

1,233,415. ELECTRICAL INSULATION; William H. Steinberg, Milwaukee, Wis. App. filed March 1, 1915. Improved binder for combination with a suitable base material, such as comminuted asbestos.

1,233,434. ARC-WELDING APPARATUS; Emerson S. Zuck, Wilkinsburg, Pa. App. filed Dec. 4, 1915. For welding hollow bodies, such as boiler tubes and the like, to boiler fire sheets or other adjacent plates.

1,233,443. SIGNALING APPARATUS; Harold G. Brown, Westminster, England. App. filed Nov. 11, 1912. Improvements.

1,233,475. INSULATOR; Christopher C. Hudson. Niceville, Fla. App. filed Oct. 21, 1916. Wherein retaining fingers for a conductor are employed and wherein means are employed for normally closing the space between the fingers.

1,233,486. ELECTRICAL INSULATOR; Fred M. Locke, Victor, N. Y. App. filed Aug. 28, 1916. Produces a more stable and permanent boron glass of high silica content.

1,233,538. CONCEALED WIRE CHAIN; Flora S. Alden, Boston, Mass. App. filed Nov. 6, 1915. Producing the conduit or hollow links from two halves separated.

1,233,559. REMINDER CLOCK; Augusta Y. Darche, Chicago, Ill. App. filed June 26, 1916. Hour-hand arbor carries a contact arm adapted to close a circuit through an alarm by coming in contact with a pin selectively set by the operator when the alarm is desired.

1,233,566. ETHYLENE GENERATOR; Walter K. Freeman, New York, N. Y. App. filed June 19, 1913. Improvements.

1,233,568. BUSBAR INSULATOR AND SUPPORT; Frank E. Getts, Chicago, Ill. App. filed July 31, 1916. Use of an internal reinforcing member for the porcelain or other friable material which constitutes the body of insulation.

1,233,569. APPARATUS FOR DRIVING MACHINES; Benjamin Graemiger, Zurich, Switzerland. App. filed May 5, 1914. A metal alloy of great strength and which is a very bad electrical conductor is employed for the separating partition between the driving and driven members.

1,233,584. MEANS FOR TRANSFERRING HIGH-POTENTIAL ELECTRIC CURRENTS AS ARCS; Carl G. Koppitz, Wilkinsburg, Pa. App. filed Sept. 19, 1913. Means for increasing the conductivity of the air at the arcing points by creating partial vacua thereat.

# *Record of Electrical Patents*

Notes on United States Patents issued on July 17, 1917

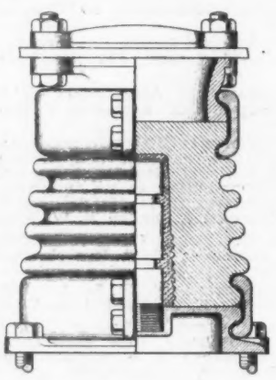
1,233,597. FLUSH SWITCH; William J. Newton, Lynbrook, N. Y. App. filed May 6, 1915. Improvements on type which is now in use.

1,233,671. ELECTRICAL SYSTEM OF DISTRIBUTION AND REGULATING APPARATUS THEREFOR; John W. Jepson, New York, N. Y. App. filed March 9, 1908. Voltage regulator for service on lamp circuits on railway cars.

1,233,673. ICE SHAVER; Frank B. Kinney, Syracuse, N. Y. App. filed April 28, 1917. Improvements.

1,233,679. ELECTRICAL SIGNAL TRANSMITTER; Judson McFell, Chicago, Ill. App. filed Aug. 19, 1914. Improvements on existing systems.

1,233,688. ELECTRIC WELDING MACHINE; Thomas E. Murray and Harry R. Woodrow, New York, N. Y. App. filed Feb. 19, 1917. Apparatus for producing toothed gears by electrically welding the teeth to a supporting member.



1,233,568—Busbar Insulator and Support

1,233,689. PROCESS OF AND APPARATUS FOR ELECTRICALLY MAKING HOLES IN METAL BLOCKS OR PLATES; Thomas E. Murray, Jr., Brooklyn, N. Y. App. filed April 24, 1917. For example, the insertion of rivets connecting such plates or blocks together.

1,233,720. FUSE PLUG; Sidney T. Sjoberg, Minneapolis, Minn. App. filed Feb. 21, 1916. Multiple-fuse plugs.

1,233,746. THERMOSTATIC CIRCUIT BREAKER; Niels Bendixen, Copenhagen, Denmark. App. filed Jan. 2, 1917. Uninclosed liquid-containing receptacle, also an inclosed one, the former being the more exposed and therefore more immediately responsive to a sudden change that may be imposed upon it.

1,233,796. LAUNDRY APPARATUS; Halvor H. Lyche, Chicago, Ill. App. filed July 17, 1916. Washing machines.

1,233,798. SAFETY LOCKING DEVICE FOR ELEVATORS; Alexander T. Mackie, Boston, Mass. App. filed July 22, 1914. Automatic safety control.

1,233,807. METHOD OF MAKING INSULATED WIRES; Robert H. Read, Washington, D. C. App. filed Jan. 3, 1914. Relates to fireproof insulated conductors of the general type.

1,233,808. SHEATHED HEATER WIRE AND METHOD OF MAKING SAME; Robert H. Read, Washington, D. C. App. filed June 9, 1917. Effectually excludes air and moisture and effects this result by filling the pores of the asbestos with a mineral oxide, such as finely divided silica or alumina.

1,233,838. ELECTRIC OVEN; Josiah Bradley, Brooklyn, N. Y. App. filed March 21, 1916. For use in bottle capping and sealing machines.

1,233,852. LIQUID RHEOSTAT; George H. Dorgeloh, Schenectady, N. Y. App. filed July 30, 1914. Set of auxiliary electrodes which are more closely spaced than the main electrodes and connected in parallel with the latter, but not immersed until the resistance has been reduced.

1,233,854. MOTOR-CONTROL SYSTEM; John Eaton, Schenectady, N. Y. App. filed April 23, 1915. Improvements.

1,233,863. CONTROL SYSTEM; Karl A. Simmon and Arthur J. Hall, Wilkinsburg, Pa. App. filed June 9, 1914. Adapted to compensate automatically for the inherent phase distortion and reduction of voltage of the phase converter under conditions of load, irrespective of whether it be a motor load or a generator load.

1,233,877. VARIABLE-SPEED CONTROLLER; Clark T. Henderson, Milwaukee, Wis. App. filed July 29, 1913. Employed to drive variable-speed mechanisms.

1,233,890. ELECTRIC-WIRE EMBEDDER; Fred W. Luerbeck, Knox, Ind. App. filed Jan. 10, 1917. Current will be directed successively through short sections of the wire, thereby requiring a small current.

1,233,899. DYNAMO-ELECTRIC MACHINE; Alfons H. Neuland, New York, N. Y. App. filed July 29, 1915. Means for adjusting and regulating the speed and torque of the machine.

1,233,900. ALTERNATING-CURRENT MOTOR; Alfons H. Neuland, New York, N. Y. App. filed Aug. 7, 1915. Means for varying the power factor, thereby permitting the motor to correct the power factor of the supply system.

1,233,952. AUTOMATIC CONTROL OF PHASE CONVERTERS; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed April 18, 1914. Relates to the automatic regulation of electro-dynamic phase converters in such a manner as to cause them to deliver balanced voltages under load.

1,233,953. REGULATOR FOR PHASE BALANCERS; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed April 19, 1916. Consists of an arrangement for controlling the direction and magnitude of the excitation applied to the booster-field coils of phase balancer so that the same may be applied to a polyphase system in which a single-phase load is apt to be taken from more than one phase of the system.

1,233,959. MOTOR CONTROLLER; Herbert G. R. Bennett, Youngstown, Ohio. App. filed March 12, 1915. Improvements.

1,233,968. ELECTRIC HEATER; Charles F. Bradburn, Belmer, Ont., Can. App. filed July 7, 1916. To facilitate the distribution of heat by means of convection or draft tubes, forming channels, these tubes or channels establishing convection currents and directing the same to such places as may be desired.

1,234,028. ELECTRIC LIGHTING APPARATUS FOR VEHICLES; William H. Honsberger, Welland, Ontario, Canada. App. filed Sept. 29, 1916. Headlamps.

1,234,060. INCANDESCENT ELECTRIC LAMP; George M. J. Mackay, Schenectady, N. Y. App. filed April 30, 1913. Nitrogen.

1,234,063. RAIN SIGNAL; Frederick A. Meng and Lee G. Schrader, Flint, Mich. App. filed May 18, 1916. Improvements.

1,234,069. ELECTRIC SWITCH; Arvid H. Nero, New Britain, Conn. App. filed Oct. 28, 1915. Flush switch of the push-button type commonly employed to control lighting circuits.

1,234,099. RECTIFYING SYSTEM FOR HIGH-TENSION ALTERNATING CURRENTS; John H. Lendi, Chicago, Ill. App. filed Jan. 24, 1916. Combines the high-tension windings of the polyphase transformer so as most effectively to utilize the waves in the combined unidirectional current.

1,234,100. RENEWABLE INCLOSED FUSE; William J. Morgan, St. Louis, Mo. App. filed July 2, 1914. To provide means making it impossible to attach a fuse link of a greater capacity than that for which the fuse is designed.